UNITED STATES ARMY OCTOBER 1968

# AVIATION DIGEST

# UNITED STATES ARMY AVIATION DIGEST


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**This month the Digest salutes the OV-1 Mohawks and their crews with articles beginning on pages 18 and 28, and on the inside back cover. Our thanks to CW4 J. P. Ervin who shot the fish eye lens views of the OV-1 on the cover and on page 28**


The mission of the U. S. ARMY AVIATION DIGEST is to provide information of an operational or functional nature concerning safety and aircraft accident prevention, training, maintenance, operations, research and development, aviation medicine, and other related data.

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Articles, photos, and items of interest on Army aviation are invited. Direct communication is authorized to: Editor, U. S. Army Aviation Digest, Fort Rucker, Ala. 36360.

Use of funds for printing this publication has been approved by Headquarters, Department of the Army, 3 November 1967.

Active Army units receive distribution under the pinpoint distribution system as outlined in AR 310-1. Complete DA Form 12-4 and send directly to CO, AG Publications Center, 2800 Eastern Boulevard, Baltimore, Md. 21220. For any change in distribution requirements, initiate a revised DA Form 12-4.

National Guard and Army Reserve units submit requirements through their State adjutants general and U. S. Army Corps commanders respectively.

For those not eligible for official distribution or who desire personal copies of the DIGEST, paid subscriptions, $4.50 domestic and $5.50 overseas, are available from the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402.

# VIEWS FROM READERS

### CH-37 MOHAVE

Sir:

Enjoyed the article by Captain Rush R. Wicker, "CH-37 Mojave — Workhorse of Korea," in the July 1968 Aviation Digest. However, Captain Wicker overlooked the fact that CH-37s have been operating for years on the White Sands Missile Range, New Mexico. We presently have aircraft numbers 54-0997, 54-1000 and 55-0650.

MAJ Valentine A. Swan
Chief, Army Aviation Division
Range Services Directorate
Holloman AFB, N. M. 88330

### PILOT ERROR?

Sir:

Before you read any further, I wish to dispel any ideas that I am going to defend the pilot and say that all this pilot error stuff is a lot of hooey. We both know that most accidents are caused by something a pilot did or failed to do. However I do propose that we stop simply pointing a finger at Peter Pilot and start asking ourselves the Big Y — Why did he goof and what can be done to help him from goofing again?

I have seen too many accident reports say substantially as follows: "The pilot allowed the aircraft to get into a flight configuration from which an accident was inevitable," or "The pilot failed to do such and such in time and allowed an accident to occur," and so on.

And let's not forget those gems which cover the instructor pilot such as, "The instructor pilot allowed the student to do such and such and failed to take corrective action in time to prevent the accident." Just the thought of allowing Beginning Ben to touch the controls is enough to put our intrepid IP's on guard.

No pilot in his right mind ALLOWS an aircraft to get out of control when he knows what the consequences are. If he does, he's a candidate for the funny farm. I know of no one who wants to make his wife a rich widow on all that insurance pilots are supposed to have and should carry. All the pilots I know would have given a million dollars each if his accident could have been avoided.

Aside from the personal embarrassment, I think we will all agree that the average Army aviator is mission-conscious. No one really has to explain to him what the effect is of grounding an aircraft for accident repair, or the impact of removing one from the Army inventory when it is totally washed out. So, let's stop looking at Peter Pilot as some kind of leper to be ostracized and let's start looking for a cure to his ills.

First, let us consider the type of aviator who flagrantly violates flight regulations and gets into trouble. Obviously he is in error. But, what is usually not so obvious is that he might not have been properly motivated or indoctrinated in aviation matters. Why?

Next, let us consider the pilot who is new to the game. Surely he has his wings. He's been graduated and is signed off as A-OK. Yet, he has an accident. Why? Statistics have shown that the greatest likelihood of an accident is in the first 500 hours of flying. How much thought is given in a unit safety program for furthering his skills and judgment after graduation? Admittedly, we can't train him forever; he's got to earn his keep sometime. Nor can we expose him to all conditions imaginable so as to enhance his judgment to build up his experience factors. When he's crashed he's certainly gained experience. Of course, this is not what we want. We must condition him to use his grey matter.

Last, we come to old reliable, the pilot with many, many hours and years of experience. How could he have let everyone down by having that accident? Guess he just goofed — pilot error! He failed to do or did such and such and allowed the aircraft to crash. Did he really sit there fat, dumb and happy and allow an accident to occur or was there some physical, training, experience or psychological factor which worked to his detriment? Was he fatigued? Despite his years of flying, was he adequately trained for the particular mission or aircraft? Was the cockpit configuration poorly human engineered which psychologically handicapped him?

We are all products of our training and experiences, not withstanding physiological factors. We have been conditioned by our conscious environments to be the type of aviator we are today. When properly conditioned we react automatically, correctly, and not mechanically. A mechanical pilot is too slow in an emergency. Accepting this, let us stop rapping Peter Pilot on the knuckles by overemphasizing that he goofed. You aren't telling him anything he doesn't know already. Instead, get him to see the folly of his ways.

Salving his feelings and kissing him on both cheeks is not the answer either. Don't oversimplify and be satisfied with the standard phrase of pilot error. If you do you are only reiterating what happened and how it happened, but not why it happened. The first two causes are usually easy to determine. The third is not.

Dig deeper into accident causes. Formulate recommendations which will improve Peter Pilot's flying skills and judgment. This may be easier said than done. At least you would have tried. And, if you haven't tried you should ask yourself — Why?

MAJ Harold Silver
Dept of Rotary Wing Tng
Ft Rucker, Ala. 36360

# Speedball

**Helicopters pick patients up at plane side in Japan and carry them to any one of five hospitals in less than 30 minutes. It had taken about six hours to make the same trip by ground ambulance before Speedball**

**Lieutenant Colonel Donald R. Jordan**

WHAT'S THE outlook for today?"

"So far 312. 192 dash 119 plus one priority burn tonight."

"What's the blocks for the burn?"

"Estimated 0031."

What's all this about? Well it is a typical conversation between the operations officer and flight scheduling clerk for one of our least known Army aviation units. The unit is the 587th Medical Detachment (Helicopter Ambulance) which uses the name "Speedball." This unit is located at Camp Zama, Japan, the major Army installation in the Tokyo area.

Through the various news media, many Americans have become familiar with Dustoff, the helicopter ambulances in Vietnam. However, very little has been heard about Speedball. Yet, Speedball is a vital link in the medical evacuation chain established for our wounded from Vietnam.

To visit Tokyo with its maze of streets and suburbs is an experience in itself. The traffic is some of the worst in the world. Streets generally are narrow and clogged with every mode of transportation imaginable. Within this complex are located several of our major hospitals, which provide vital care for our Vietnam wounded. These are located at Camp Drake, Camp Zama, Yokosuka Naval Station, Kishine Barracks, and Oji. The latter recently made the news because of opposition demonstrations against our establishing a hospital in that area of Tokyo.

Our medical facilities in Vietnam are designed to provide immediate treatment to the sick and wounded. They provide continuing care only to those whose problems are not too severe to require evacuation from the country. Those patients who require extensive treatment or care can be supported best away from the battlefield. To provide this care is the purpose of the medical complex in Japan. Here the patients are treated until they are healed or cured or until they can take the more strenuous trip to the United States of America.

Understanding the necessity of this stopover in Japan can best be achieved by understanding a part of the typical mission mentioned earlier. The term "priority burn" refers to a patient being evacuated from Vietnam who has been seriously burned. The word "priority" indicates the patient must be moved from plane side within one hour after the aircraft "blocks" or arrives on the unloading ramp at the destination.

The Army has a vast burn treatment center at Brooke Army Hospital, San Antonio, Texas. However, to evacuate a patient directly to the States involves some serious complications. Burn patients need constant and highly specialized care. The distance involved, even in the jet age, greatly hampers the patient's chances of survival, since this intensive care is almost impossible to provide aboard an aircraft. To throw the odds more to the side of the patient, the Army has established a burn center, smaller but very similar to Brooke, at Kishine Hospital in Japan. Here, the patient is treated until he can safely travel to Brooke. Travel time from Vietnam to Yokota AFB outside of Tokyo by jet transport is about 6 hours.

The rest of the typical mission information refers to the number of litter and ambulatory patients involved. In this example, there are a total of 312 patients. One hundred and ninety two are litter patients, one hundred and nineteen are ambulatory and one is the priority burn litter case. Before May 1966, these patients were moved to Kishine by ground ambulances. The travel time from Yokota to Kishine by such means averaged 6 hours. The time was very close to the travel time all the way from Vietnam. This factor increased the odds against the patient's chances of survival. To rebalance these odds, Speedball came into being. By using helicopters to pick up the patients right at plane side, they can be unloaded at any of the 5 hospitals in less than 30 minutes after being

Above: the patient holding and clearing facility at Yokota AFB is at lower center where most inbound patients are processed. They receive instant and sympathetic attention (below)

**Good maintenance procedures have enabled the unit to maintain a high rate of availability**

placed aboard the helicopter. In the case of the burn patient, he is moved directly from the jet to the helicopter and then to Kishine. Within a time frame that greatly enhances his changes of survival, he is in the hands of some of the best doctors and medical personnel available anywhere.

Possibly this seems like a rather simple matter, but crank into this picture several major factors such as around-the-clock operation in all sorts of weather, complicated by one of the smoggiest cities in the world, and you have flying conditions requiring the utmost in skill in our chosen profession. This is still further complicated by the landing areas at the various hospitals. These are not "airfields" or prepared helipads one might imagine. Rather, they are small, congested areas which were set up to accommodate the emergency of the situation. The landing area at Kishine, for example, is one that would make many "confined areas" look like Dulles International. It is a very small parking lot partially surrounded by four story hospital buildings and 2 high voltage powerlines and further congested with parked cars over about one fourth the area.

I have had the honor of flying with this unit on several occasions during the past year. Believe me, the conditions encountered day in and day out by the Speedball pilots are among the worse possible anywhere. One might say that only being shot at could complicate things more. Yet, do not think Speedball pilots don't have similar problems. They have to weave in and out of mass kite flying and bunches of balloons near the various installations. Since their activation in May 1966, they have piled up some very impressive statistics. Since activation and through 31 May 1968, this unit has handled 64,748 patients of which 34,804 were litter patients and the other 29,944 were ambulatory. In addition, they have flown some 2,306 passengers to include the required medical flight attendants. Also, they have carried some 84,622 pounds of medical supplies. Much of this was priority whole blood being needed by various hospitals. All this represents 6,330 flying hours.

There have been several peak periods in their workload. The most recent and also their highest peak came during the month of February 1968. During that month, the peak was 7,404 patients requiring 498 hours of flying. These peaks can be traced to major ground actions in Vietnam such as Loc Ninh, Dak To, and the TET offensive. The reader, however, should not try and draw a parallel between these figures and the official wounded in action lists released by the DOD. The reason for this is that these figures on patients not only include the incoming patients but also represents those that are flown from hospitals to the planes

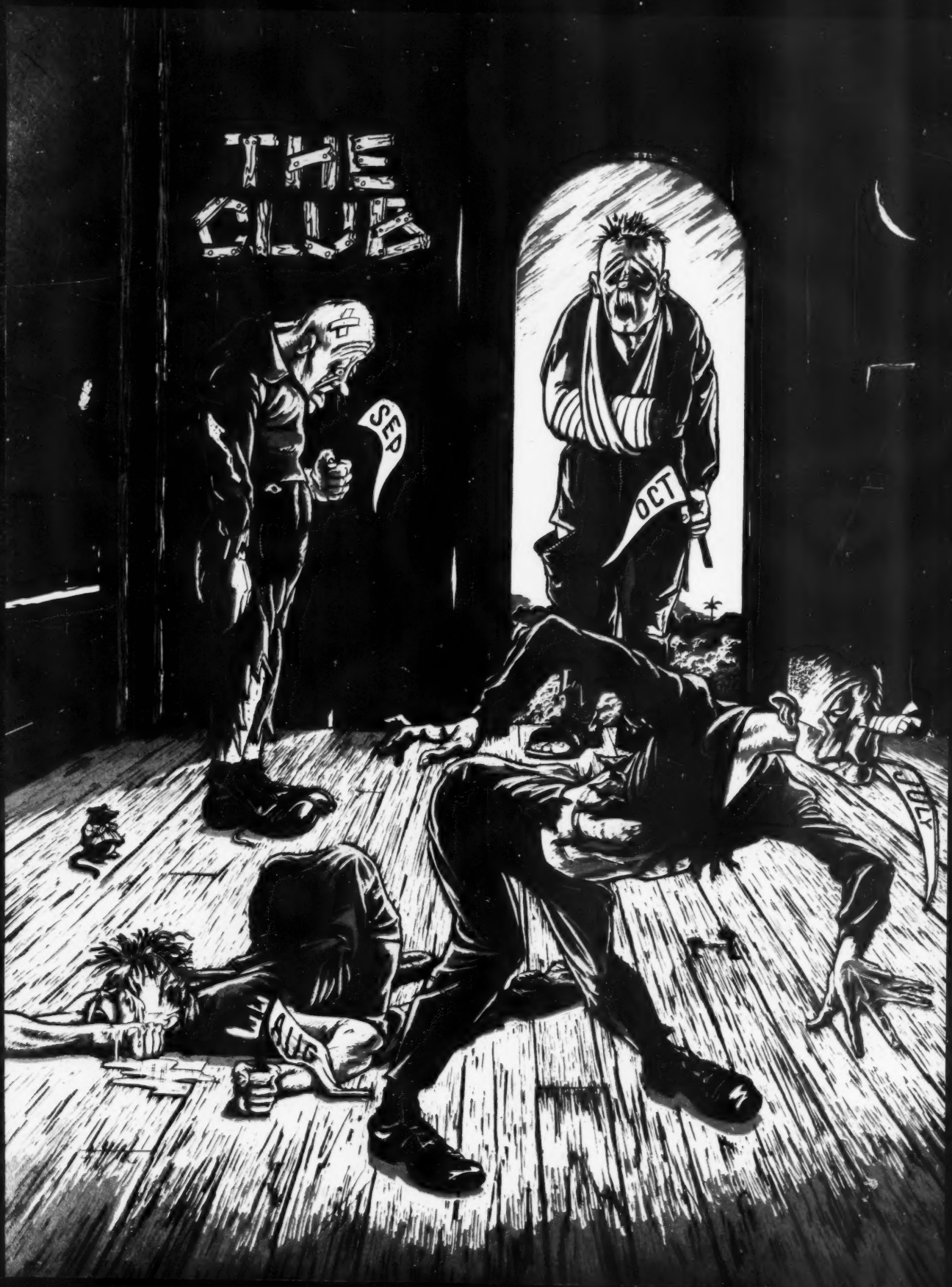
which will return them to the United States. Also, these figures include not only wounded men but men suffering from various serious ills and diseases caused by the rigors of Vietnam.

Carrying on this work is a complement of 10 Army aviators with six UH-1Ds. All except one is a veteran of Vietnam where all but two flew with Dustoff units. One pilot has had two tours in Vietnam and three are on orders for second tours. Two others are on orders to join new units in the States. Yet each of these aviators finds great satisfaction in his work. This is shown in their personal concern for each patient's comfort and well being and in the fact that regardless of how tough the flying gets, they are never heard to complain.

The complement of crewchiefs, medical corpsmen, and support maintenance and administrative personnel cannot be overlooked either. These men have directly contributed to the success of the unit. They have worked just as long and as hard as the aviators which is readily seen in the high rate of availability they have been able to maintain the last year — 79.95 percent, 8 percent over the DA objective.

It goes without saying that many a wounded fighting man, whether he is Army, Navy, Coast Guard, Marine, or Air Force, owes his life to the rapid evacuation system of the U. S. Military medical system. The members of Speedball are proud to be a part of that system and deserve a vote of thanks from all of us for a job well done.

**Above: the approach to Kishine Hospital. Note high voltage lines at bottom — making it a tight squeeze on a hot day with six litters. Below: a burn patient arrives for treatment**


THE CLUB
SEP
OCT
AUG
JULY

# The Club accepts major accidents only, once a month

CW3 Derral R. Waters

CRASHFACTS HAD been on R & R and upon returning found that his unit was not there. Someone had the nerve to actually send them to the field. He found a note neatly attached to his bunk which said in effect, "Catch the first slick out and get up here."

Upon arriving at the scene he found two things right away. First was one of those lovely machines spread out on the runway in an uncouth manner. The second was evidently the new commanding officer, and he appeared to be chomping at the bit. This didn't look good to Crashfacts. He would bet his grenade launcher that this guy was going to want him to investigate and make a report on this thing. He walked up to the scene, peeked around the rear of a ¾-ton truck, and put a discerning eye upon the area.

Having seen enough to know that this was no place for him, he turned around to scan the area and came face to face with the bit-chomper. "Well, Crashfacts, I've been waiting for you for several days. I understand that you are my safety officer."

"Oh, well, no sir."

"Yes, you are."

"Ah, well, no sir. You see just because I've had the course at USC is no reason for you to give me the job. Besides I've had it three times already. Again?"

"Again. Now give me a rundown on our past record."

"Well, there had been two before I joined the unit. Captain Blank got a little rattled, simply because Charlie was shooting at him while on short final to an LZ, which was small, and he tangled rotor blades with another slick. He had been winning all of the money in the poker games so they charged that one up to him as pilot error. He didn't take it to heart though; he's still winning.

"The other is still open for talk. Ten slicks and five guns went IFR in formation and they lost a gunship and crew. They charged that one off to 'disorientation of pilot brought on by IFR and night flying conditions.' Of course they weren't instrument rated either. We are in real good shape on minors, incidents and forced landings. We don't have any. Major accidents only, and one of those each month. That gives almost every pilot the opportunity to join."

"Join? Join what?"

"The accident of the month club. Each aircraft commander and pilot can get in for about $125,000. Times two equals about $250,000, for each Huey, that is. Most everyone is a member now, except a few of the new guys. Our October entry candidate was the best so far. They loaded tile 'til it was 400 pounds over maximum gross and . . . Sir? Yes, tile — floor covering, you know — and of course the aircraft dropped in on the road. A real good job — banged it up extensively. We disqualified them though and classified it as an incident because he was over max gross. That's one of the rules. You have to be at max gross or less. We had three other tries that month, too. One hit a stump doing about 60 knots, but he just ripped off a skid. Another hung up a skid on the psp and didn't land hard enough to do more than just spread them. The last one threw a handful of dzus fasteners through the intake at a hover. He chickened out and pulled collective.

"The November member entry was unplanned. His engine failed and he picked the smallest trees in the area, about 125 feet tall, and let her go. He qualified. Going in to pick them up presented the opportunity of a tour. Just one bomb crater in the entire area. The first two ships that tried just had to have new main blades. The third qualified; he got all the way down into the hole and then stuck his tail rotor into a snag. A lot of guys feel that he shouldn't have done that. It was one of our newer ships, and we were even more peeved when we had to call tacair in to deny its access to the Cong. They said that they were combat losses. I said they were major accidents. They said they didn't know how they were going to get along without me as their ASO, but starting then they were going to try.

"I was the only entry for December. When my tail rotor gear box took off down the runway on a short final without waiting for the rest of the aircraft, I qualified and was relieved from the ASO job all

**The aircraft commander couldn't wait 15 minutes and elected to go in downwind. After splattering the Huey over the LZ, he spent the rest of the day hiding out from the pilot**

in 30 minutes. Something about image, and ASOs weren't authorized accidents. They wrote that ship off as pilot error for sticking my tail rotor blades in the runway.

"January entry, an aircraft commander, couldn't wait 15 minutes or so for artillery to lift so he could get a load of C rations in, and elected to go in downwind. He qualified after spraying it all over the LZ, but had to spend the rest of the day out in a foxhole. He couldn't face the pilot's wrath.

"The maintenance officer couldn't wait (a most impatient bunch of pilots we have here) for February, so during an autorotation he took full advantage of the situation to wipe out that hangar queen by neglecting to pull pitch at the bottom. We let him in early.

"Charlie made February's contribution by scaring a slick coming out of a hole. The crew, seeing an opportunity, went along and totaled it out with no injuries.

"March's entry went on R & R, so in April he beadyeyed some wires stretched across the end of the runway. He said, 'If I load up all she will hold and take off downwind over those wires, I might not make it.' He didn't.

"But he did put enough dents into it to require a slingload job out to the major overhaul facility. Everyone was out to watch her go. She didn't look as proud as she once did, hanging under that big monster. The next day we received a call from the overhaul people. They said, 'You know that slick we picked up yesterday? Well, change your report from major damage to total loss. The sling failed and we dropped it from 2,500 feet. You should have seen her go. All the characteristics of a rock. Well, call us if you need us again.'

"In April we lost a gunship with two injuries.

"Our May flower was making firing passes and forgot that he wasn't supposed to overfly the target. So, the fourth time around, Charlie forcefully reminded him of it. As he was going down in flames, we feel that he got the point and he won't do that again. We picked the crew up a short time later, all four very red-faced. It seems they had departed the aircraft with just one .45 among them. Charlie helped this pilot, but four passes qualified him for membership.

"The spectacular for June came a day early. Seizing upon an opportunity presented by a stump hiding in the grass, he just slipped her over a little bit on pickup. It was perfect: a beautiful slow roll to the right. You should have seen that transmission and head fly as it departed. It was probably something you only see once in a lifetime and you missed it. You don't think that's funny, sir? Yes sir!

"There is still some debate on July's mishap. Do you believe that

**The October entry into The Club was a dandy. He had his aircraft loaded with tile 'til it was 400 pounds over maximum gross. Of course, he dropped in on the road — a real good job**

those slicks have a personality all their own? The pilot said that the first time into this LZ with high elephant grass that it sort of fidgeted around — like the grass was tickling its belly. The second time it must have really tickled because it backed up and stuck the tail rotor into a tree. This must have really given it a thrill because it went all to pieces. Sir? You don't think that's funny either? . . . Yes sir.

"Later that month one slick rolled out of formation with a flight control malfunction. This seemed to have a very sobering effect on all concerned, Major, as to the necessity of still performing good preflight inspections.

"In August old 75 was on a resupply mission with a load of C rations. Around 2,000 feet, her engine failed and began to burn. Seeing her falter, the gunner departed his post and began to lighten her load on the way down. He worked fast, but to no avail. She landed hard, sighed, and collasped, folding her blades around her boom. All was not lost, however, as that string of C rations accounted for 13 banana and 27 rubber trees, all Charlie's.

"Our September entry was not to be outdone. Everyone watched him lift off, turn right, and disappear; he dropped it into the only hole in the ground for 30 miles around. He was repositioning himself in formation and turned downwind with a full load of troops. He bet his copilot that it would fit in the hole. It did — almost. I really believe he could have done it if he hadn't turned downwind. He should have gone around the hole and tried it into the wind.

"You ask what can be done. The first thing to do is disband the club. The cost is extremely high; besides it cuts into your aircraft availability for the missions on hand. Take a definite interest in the safety program. Let it be known that you are interested in the safe operation of your aircraft and crews on all their missions. You can also recommend that they use more discretion and more common sense in completing a mission. In doing so, they will be more likely to have an aircraft to fly tomorrow. There is a bad habit going around of accepting an aircraft for missions when there is some doubt that it is mechanically ready. Aircraft flown so many hours require so much maintenance. You must see that that maintenance is performed by the book.

"Well, anyway, that would be a beginning, and uh, sir, I can see why you're frothing at the mouth. Yes sir, I take it that I'm relieved from the job again. Well, I just stopped up here en route stateside anyway. You see that slick running up down there? Good luck, Major!"

# Mission Completed?

**Captain J. Hatcher and CW2 P. Stietenroth**

IT IS GENERALLY accepted that a mission is completed when all tasks assigned by the commander have been successfully accomplished. But let's take it one step further in the case of helicopter support with Army aviation and say that a mission is successfully completed when aircraft and crews have landed at home base and are available for other missions that will arise.

Questions that invariably come to mind are, What about weather conditions? What if home base is IFR?

Several solutions may be quickly and easily arrived at here in the States. The aircraft could be shut down and the crews could wait out the weather; or with only a few hundred feet of ceiling the helicopters could proceed on by flying low level, following a highway, etc.; or an instrument rated aviator would possibly elect to file a 175 and let the air traffic control center and approach control get him home.

In a combat environment such as Vietnam things take on an entirely different perspective. Situations like the one described above pose special problems on their own such as: The aircraft can't be shut down in this area; it's too 'hot'; we can't go low level in this area, there's too great a chance of drawing enemy fire; out in a remote combat area there is no air traffic control center, or departure or approach control to clear you on your way under IFR conditions.

Let's take a look at a possible solution to this problem that is being presented to WORWAC and ORWAC students at the United States Army Aviation School while engaged in FEX training with the Department of Tactics.

"Outlaw 20, this is Outlaw 21. Delta center advises that homeplate is under IFR conditions, and that combat operations center has secured airspace up to 5,000 feet from our present location to the Tacker nondirectional beacon and homeplate, from 1500-1800Z. Outlaw 21 will climb to 800 feet indicated (MEA)[1], Outlaw 22 will climb to 1,300 feet indicated[2], Outlaw 23 will climb to 1,800 feet indicated, Outlaw 24 will climb to 2,300 feet indicated, Outlaw 25 will climb to 2,800 feet indicated, and Outlaw 26 will climb to 3,300 feet indicated. There will be a 5 minute separation between aircraft[3], and all aircraft will monitor platoon FM and company UHF frequencies for control. Time is now 1512Z, and Outlaw 21 will be pulling pitch 1 minute from now."

At first glance, one might naturally ask, What's happening here? Well, let's take a closer look. First of all WORWAC and ORWAC students are receiving 50 hours of instrument training in tactical ADF and GCA procedures. Next, the platoon leader has decided to return to home base under IFR conditions (thus masking their movement from the enemy and eliminating the possibility of being exposed to enemy ground fire while flying at low level) with a letdown to minimum safe approach altitude at home base through use of a nondirectional beacon (ADF) and tactical ADF procedures[4] with a GCA backup at home base.[5]

Let's return now to our platoon of helicopters on their return flight to their home base. First of all, the ADF receiver in each aircraft would be tuned to the desired frequency at the tactical ADF site. A commo check on FM, UHF and possibly VHF radios would be made to ensure that each aircraft had good radio contact with each other so as to maintain internal control. It is essential that internal control and radio contact within the group be maintained throughout the flight so that each aircraft in turn can be "stair-stepped" down to MEA before reaching the beacon.

For example: Outlaw 21 reaches the beacon at 800 feet indicated, calls station passage, turns to his outbound heading for 15 seconds and starts a standard rate turn of 270° back to the beacon and lets down to minimum approach altitude. Upon reaching the beacon at minimum approach altitude he calls station passage either VFR, or in contact with "Angel" (GCA) on a radar vector away from the station to home base.

This clears Outlaw 22 to descend from 1,300 feet to 800 feet (the altitude vacated by Outlaw 21), which in turn clears the third aircraft to descend to the altitude vacated by the second, etc. Each aircraft in turn calls, departing their previously assigned altitude and going to the lower altitude just vacated.

Normal radar procedures apply, in that positive radar contact is established, and lost commo procedures, active runway, field elevation, and current weather are given. After being established on final approach heading, the aviator is told to start a letdown of 500

fpm at a predetermined point and is also given a minimum safe altitude.

If we could imagine an aviation commander standing on a "home base" airfield in a combat area, watching his aircraft break out through the cloud cover on final approach, he might well be thinking to himself that here is another mission that has been *successfully completed.*

**[1] After a careful map study, the aviator determines the highest terrain elevation and obstacles on his intended route of flight. He then adds 500 feet to the highest feature and this gives him his minimum en route altitude (MEA). In this case it was determined that the highest terrain elevation was 200 feet and the highest obstacles were trees, which were given a value of 100 feet. Then another 500 feet of vertical clearance was added to this to give an MEA of 800 feet.**

**[2&3] Even though the illustration here indicates a vertical separation of 500 feet and a lateral separation of 5 minutes between aircraft, students presently are being trained under the hood only during VFR conditions with vertical and lateral separations of 200 feet and 2 minutes. This is due primarily to airspace and time restrictions imposed by training airspace and time block schedules available in the training environment.**

**[4] Tactical ADF procedures involve use of a standard figure 8 pattern over a nondirectional beacon with a predetermined final approach (see fig. 1) azimuth and minimum approach altitude being given.**

**[5] The mobile field GCA unit is used to monitor traffic and provide a capability of final approach radar vector to home base with a predetermined start point for approach from a given altitude down to a minimum safe altitude (usually 200 feet above field elevation at home base), see fig. 2.**

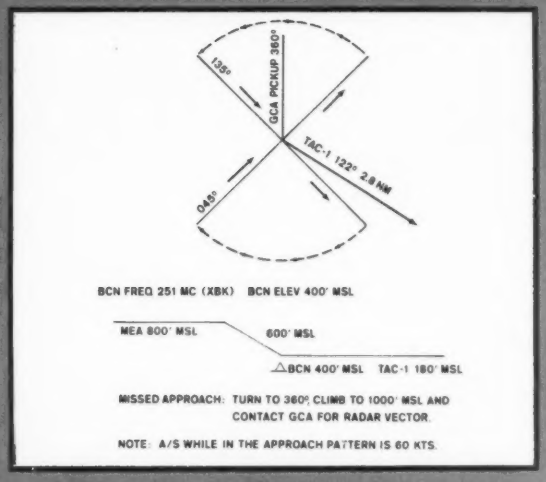
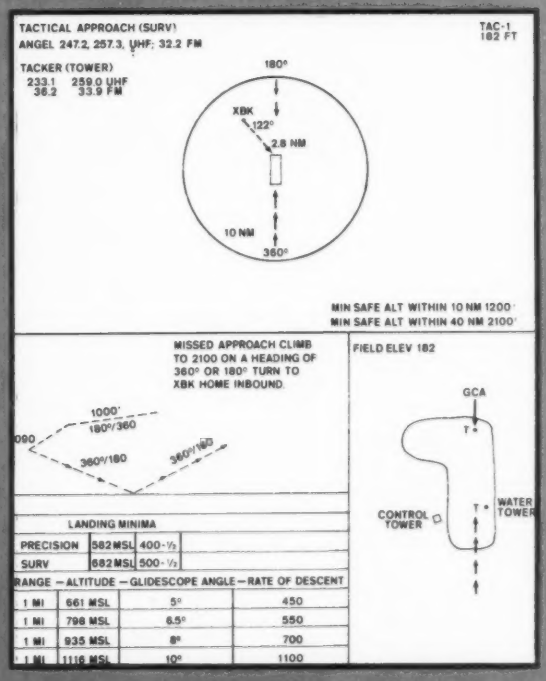

135°
GCA PICKUP 360°
TAC-1 122° 2.8 NM
045°
BCN FREQ 251 MC (XBK) BCN ELEV 400' MSL
MEA 800' MSL
600' MSL
BCN 400' MSL TAC-1 180' MSL
MISSED APPROACH: TURN TO 360°, CLIMB TO 1000' MSL AND CONTACT GCA FOR RADAR VECTOR.
NOTE: A/S WHILE IN THE APPROACH PATTERN IS 60 KTS.

**Figure 1 (above) TAC-1 tactical ADF approach**
**Figure 2 (below) TAC-1 tactical radar approach (surv radar VFR training only)**



# TACTICS

**Realism and practicality are the keynotes of the tactical employment phase of student aviator training at the Army Aviation School**

ONE OF THE greatest benefits the U. S. Army Aviation School has to offer student aviators is the invaluable experience gained by aviators who have served in Vietnam. These aviators are able to compare training received with that actually needed in Vietnam.

An outstanding example of this increased knowledge in action is demonstrated in the tactical employment phase of an aviator's training. Whether the trainee is rotary or fixed wing, during the last two weeks of training he will execute practical missions and will fly as a member of a team without an IP.

This portion of training is constantly changing to keep abreast of the needs. Realism and practicality are the keynotes, and reports from commanders in Vietnam indicate the school has been able to maintain the flexibility needed.

Recently, two major changes in rotary wing training have occurred — changes that are complementary to Army aviation's mission in that they benefit both the aviator and the ground troop.

Before March of this year (1968) rotary wing students at the Army Aviation School simulated troop carrying missions with tanks full of water. While this can approximate the weight the aviator might experience in Vietnam, the load is too stable. Also, it does not offer any training in on- and off-loading of personnel.

At the same time, the Army's Ranger School operating in northwest Florida found it necessary to use trucks to simulate boarding and off-loading of aircraft for its students.

Within 100 miles of each other, both schools were having to settle for a makeshift facsimile of the actual conditions that would later be experienced.

Realizing the potential of combining the training efforts of the aviation school and the rangers, a trial maneuver was held in early March which proved to be ideal for both schools.

Flying in full formation, the aviation students left in 28 helicopters from Fort Rucker's TAC-X stagefield and flew to the Eglin AFB reservation where the rangers train. At the same time approximately 150 ranger students set up landing zones in a heavily wooded Florida area.

As the aviation students neared the ranger LZ, the gunships broke formation and simulated prep fire runs, while the slicks made ready to pick up personnel.

Rangers marked the LZ and the slicks moved in. As the last ground troops were buckling in, the aircraft lifted off the LZ and headed for the next exercise area. The speed with which the entire operation has been executed is commendable, realizing that certain safety factors must be observed in training.

When the aviator is assigned in Vietnam, necessity may not allow him to wait until each passenger is securely buckled in, but for obvious safety reasons, this is a must in the

training exercise. Also, when the aircraft lands at an LZ to deploy troops, no one leaves the aircraft until it is firmly on the ground — a practice not always practical in Vietnam.

While some of the more rugged individuals may scoff and wonder why the schools "go only halfway," the most realistic training in the world is of no value if the student receiving it is killed or seriously injured.

Another step towards combat realism came coincidentally with the joint rotary wing-ranger maneuvers. The school has begun practice with "hot" refueling. The aircraft, eight at a time, line up around a field expedient refueling system and are serviced without shutting the engines down.

When the eight-ship flight is serviced, it is immediately able to fly off on another mission with minimum delay.

After-action reports by the students indicate this new phase of training has many advantages over the static load missions in the past. Most said it was a considerable change to have a load that is constantly shifting instead of the relatively stable tank of water.

The ranger personnel now have the advantage of actually setting up and marking functional landing zones and of rapidly boarding and dismounting aircraft.

The limited access landing zones with actual ranger personnel lend an air of realism that seemingly has a favorable psychological effect on the student.

Currently the joint exercise is only one day of the two week TAC-X training, but each student is given the opportunity to fly each type mission during that day. During the remainder of the TAC-X program students are given many other chances to spread their wings on their own.

Each student aviator plans a mission, the best of which will become an actual maneuver for the entire group, and the more promising students will assume duties as commanders and flight leaders.

Operations orders for the two weeks include troop and cargo movement missions, internal and external loads, night combat support and extraction of forces.

Frequently missions are changed during flight and the students must make last minute changes in plans. Every effort is made to expose the student aviator to situations he will encounter in Vietnam.

Single ships are used for route and landing zone reconnaissance and, at night, will test the students' knowledge of instrument flight.

Students in the fixed wing course undergo similar comprehensive training, but do not participate in the joint maneuvers with ranger forces. Much of their training is in target detection and marking and in aerial reconnaissance.

Both groups live in the field for the two-week period. The final flight over the post parade ground marks the end of training and the beginning of practical application.

**The Army Aviation School has begun practice with "hot" refueling**

# The U. S. Army Aeromedical Research Unit

**Captain Dudley M. Clark**

SHORTLY AFTER being assigned to Fort Rucker, I began inquiring about what, if anything, was being done to provide protection against hearing loss and better communications for the CH-47 helicopter operators. My search led me to the office of a psycoacoustics and audiology expert for the United States Army Aeromedical Research Unit. In his elaborate laboratory, he played for me a tape recording which demonstrated his ability to untangle the background noise from voice transmissions in the Chinook helicopter. His solution is complicated and expensive, but it works. It is a step toward an effective communications system, which all CH-47 operators, air traffic controllers, and both aviation and ground commanders will appreciate.

The United States Army Aeromedical Research Unit (USAARU), a class II activity of the Medical Research and Development Command, was established in July 1962 by Department of the Army to provide medical research support for Army aviation and airborne activities. USAARU is located at the U. S. Army Aviation Center where it is near a large and changing population of aviators, a variety of aircraft, and other research activities supporting Army aviation.

Some of these activities include: the Aviation Test Board, Combat Developments Command Aviation Agency, Army Board for Aviation Accident Research, Army Aviation Human Research Unit, and the U. S. Army Aviation School. USAARU's close relationship with this select group of personnel and activities has contributed greatly to developing a research program which is specific and responsive to Army requirements and operational programs. Liaison is also maintained with research laboratories of other military, governmental and civilian research agencies to preclude a duplication of research effort.

The complimentary missions of USAARU and the Naval Aerospace Medical Institute (NAMI) at Pensacola, Fla., have fostered a close relationship between the two organizations which has resulted in several jointly conducted projects.

The general direction of USAARU's research program has developed as the result of inflight observations, field problems reported by other aviation agencies, and the technical evaluation of aircraft and personal equipment as related to the medical aspects of man-machine capability.

The USAARU staff consists of 14 principal investigators and 26 technical and administrative personnel. The professional group is composed of both military and civilians and includes specialists in aviation medicine, cardiology, neurology, bio-physics, physiological optics, experimental and sensory psychology and physiology. Many possess either an M.D. or Ph.D. degree. Supporting technical and administrative personnel possess capabilities in electronic instrumentation and telemetry, automated data reduction, veterinary sciences, microtechniques, high precision machining, technical drafting, and library science.

USAARU's facilities include five cantonment type buildings with more than 18,000 square feet of

**An experimental helmet is tested in the sound chamber**

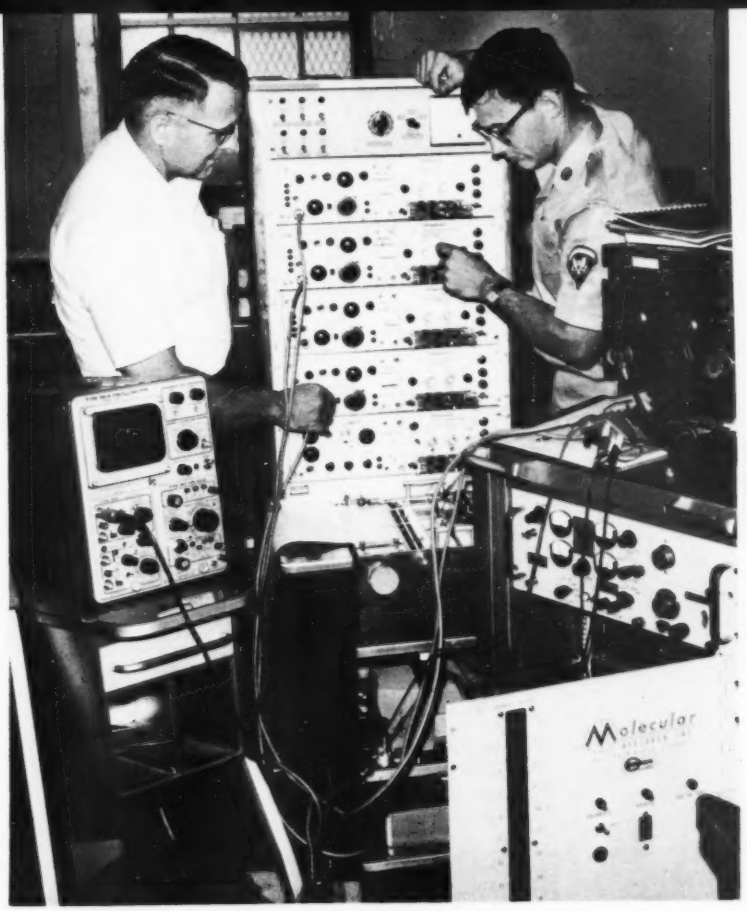
space which contains over $600,000 worth of equipment used in the research program. The research library contains over 6,000 volumes and reports and over 200 current periodicals concerning aviation medicine and military aviation. The unit also maintains an electronics shop and a general machine, carpentry, metal and plastics fabrication shop. Both are fully equipped and adequately staffed. In addition, research personnel are supported by an automatic data processing section and a skilled draftsman.

Projects undertaken by USAARU often involve several elements of the unit. Current investigations range from long term studies in color vision and hearing loss to the more immediate problems associated with the helicopter and airplane cockpit environments.

In the area of cockpit comfort as related to aviator efficiency, USAARU constantly conducts cockpit dimensional measurements to ensure that space is adequate and that aviators have access to necessary switches and circuit breakers used in normal operation. Several different systems for circulating cool air in the cockpit or flight suit are also under investigation. Such a system would add significantly to crew efficiency in the humid tropics in which we must operate.

For instrument rated pilots, a device is being tested which would eliminate the conventional (and awkward) hood used during instrument flight training. It consists of a pair of glasses designed to restrict vision without the use of large panels which also restrict the vision of the safety pilot.

Other studies concerning aviator and crew environment include those on air contamination, methods of improving dark adaptation by reducing glare and reflection in the cockpit, and a product which when applied to either glass or plexiglass would eliminate the problem of rain dispersing on windscreens during flight. Use of the latter product would drastically reduce the number of plexiglass windshields damaged through improper use of conventional wiper blades.




**A test of TH-13T vertigo problems under instrument conditions**

USAARU experts are devoting much of their time to solving, or at least lessening, the problem of midair collisions. This problem is particularly severe where a high density of aircraft exists in limited airspace along main communication routes in Vietnam and at aviator training sites in the States. Three current projects under investigation are various combinations of paint on rotor blades, rotary wing tip lighting of adjustable intensity, and feasibility of using high intensity strobe lighting for daylight operation.

In the area of aviation manpower, USAARU experts are reviewing standards for both refractive error and color vision deficiencies in hopes of finding a larger proportion of qualified applicants.

The last area of interest is the one which directed my attention to USAARU. What is being done to protect the hearing of aviation personnel and to aid them in more effective communication with ground and other airborne stations? Studies applicable to all Army aircraft include:

• Measurement of sound pressure levels in Army aircraft, which compares measured intensity levels

against those required by Army specification.

• Effects of distortion in aircraft communication systems, which include evaluation of all standard airborne radios and intercom systems in various aircraft.

• Hearing protection devices evaluation, which examines sound attenuation characteristics of various protective devices.

After investigating 36 separate hearing protective devices, USAARU issued two reports which point out some of the acoustical shortcomings of the Army APH-5 helmet as compared to other hearing protective devices being produced.

USAARU Report 67-6 concerning sound attenuation characteristics of the APH-5 concludes: "The mean attenuation values derived from tests have shown that the APH-5 does attenuate adequately between 4,000 and 8,000 Hz [Hz stands for 'Hertz,' the term which replaces 'cycles per second' ]. At test frequencies below these values, the attenuation is considered to be from poor to very poor. The region of 250 and 500 Hz, where the least amount of attenuation was obtained, is considered to be critical for communications purposes." The report further recommends: "In view of the poor sound attenuation characteristics of the APH-5, it has been recommended that the present earmuffs be replaced with high efficiency ear protective muffs. If changing earmuffs is not feasible, it is recommended that the APH-5 be replaced by a helmet with high sound attenuation characteristics."

To follow this report with an alternative to the relatively inefficient APH-5, the market was canvassed for a flight helmet with better acoustical efficiency which would have relatively the same crash protective capability as the current APH-5. Through extensive testing on the same basis as the APH-5, USAARU Report 67-8 defines the Navy SPH-3 (modified) helmet as " a relatively efficient attenuator of sound." The modification, which was suggested by USAARU personnel, incorporates two elastic straps behind the earcups which provide a better acoustical seal between the ears and the liquid filled ear cushions.

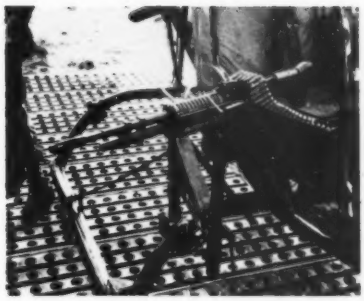
USAARU Report 67-8 concludes that the sound attenuation characteristics of the SPH-3 (modified) are superior to the sound attenuation characteristics of the APH-5 between 75 and 2,000 Hz, the frequence range of normal voice communication. The test of the SPH-3 has demonstrated that helmets are available with acoustic characteristics that are superior to those of the APH-5. In view of the manifest need for more protection for Army aviation personnel and improved voice communications, it was recommended that the SPH-3 be considered as a standard for Army personnel.

These two reports represent only one of many fields and problem areas being investigated by USAARU experts. However, they illustrate clearly that the dedicated and truly professional nature of both the civilian and military members of this diverse organization are a functional part of Army aviation research and development.

By maintaining a close relationship with the Army aviator and the active research of other laboratory groups, USAARU will continue to provide operational answers to a wide variety of problems concerning the aviator and environmental factors affecting him.

**Tape recorders are used in USAARU sound studies**

# OH-13 Door Gun



**People pointed, stared, and smiled**
**But our OH-13 door gun is effective**

**Lieutenant Richard L. Greene**

FIELD CONDITIONS frequently dictate new, unusual adaptations and uses of equipment. Some of the variations live the short life of a field expedient, while others live on to be refined to perfection. Regardless of longevity, in a hostile environment man will seek ways to defend himself and to counter the enemy's attack.

Our aerial scout platoon in Vietnam was in need of an effective weapons system for OH-13 scout and reconnaissance missions. While flying bomb damage assessments, road recons, village pacifications and screens, we ran into an occasional Viet Cong and were in need of a good weapon for policing actions.

Vietnam's dusty airstrips and high density altitudes combine to prohibit effective use of the M-6 machinegun system. Hand-held M-60 machineguns were tried but were too cumbersome. We tried M-79 grenade launchers, but the forward airspeed of the ship makes it necessary to "lag" the target. Few observers can master the proper lag which, of course, varies with altitude and airspeed.

How about the M-16 rifle? Well, we found that when fired on full-auto, our observers would empty the magazine before getting on target. On semiautomatic the rifle didn't provide enough firepower. Our squadron S-3, acting as observer, caught a pistol wielding VC in an open rice paddy. Relying on his own 9 mm pistol our S-3 was victorious and downed the VC. Neither the M-16 nor the 9 mm pistol provided the answer to our problem.

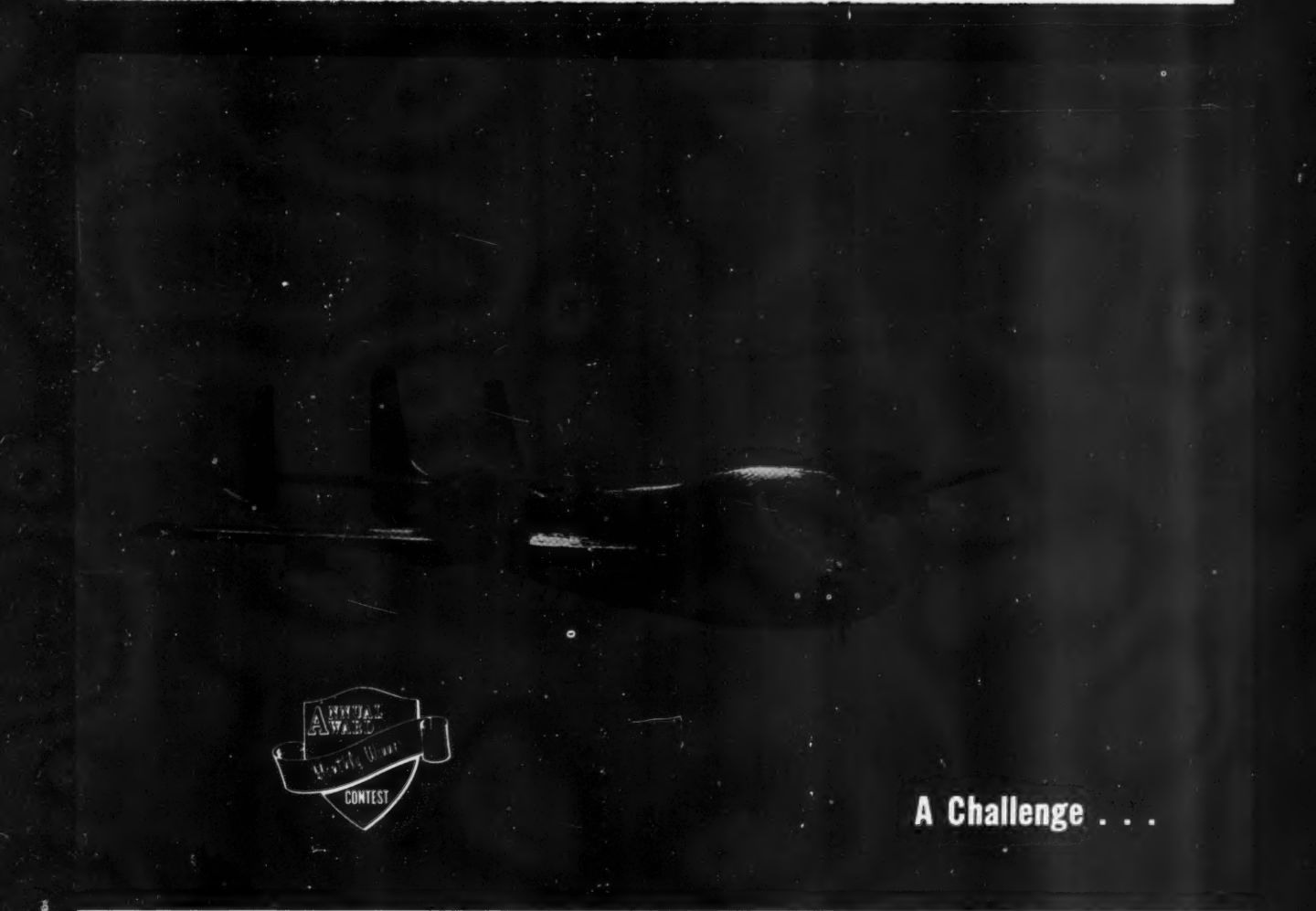
To an enterprising crewchief, the answer was obvious. We needed a door gun à la slick. He set to work scrounging parts. A truck machinegun mount served as the base upon which a swinging mount from a slick was placed. The truck mount was attached to the cross tubes by bolting it to the old M-6 brackets. Braces were run from the truck mount to the cross tube and from the mount to the skid at the ground handling wheel aperture. An M-60 machinegun was secured to these mountings.

Performance of our door gun system was good. At first we were worried about weight and balance. The weight on the right skid was noticeable in the cyclic but was not a problem. The ship, with pilot, observer, 600-800 rounds of ammo, smoke grenades and assorted survival equipment, is heavy but will still operate in 3,000+ feet density altitude conditions. The gun can be pulled right up against the door with the ammo can inside the cockpit, so wind resistance is a negligible factor.

The weapon mounted in this manner has proved very handy. It's just the ticket for reconnaissance by fire and in some tight situations for suppressive fire. The one time I had occasion to sit in the observer's seat behind the door gun we had a chance, low-level encounter with several Viet Cong. One dead Charlie was the result.

When people saw our OH-13, they stopped, pointed, stared and smiled, but the door gun is effective, and in a day and age when the cost of a dead VC is astronomical, it is a good way to help lower the overhead.

**An M-60 machinegun is mounted on an OH-13 helicopter**




# Mohawk Infrared Mission

**Major Donald I. Bernstein**

THE CQ RUNNER shook my shoulder indicating 0010 hours local time RVN. Time to get up. Darn my operations people. Did they have to be so efficient and remember to wake everyone up — well almost everyone. Well, I trained them so I can't complain. Seems my life is in reverse of the rest of humanity. When I work they sleep and vice versa. Well that's my lot. Everybody's got it tough I guess. Only 20 minutes to get washed and dressed for my briefing. Better step on it.

That shower sure felt refreshing. A nice cool morning. Seems every star in the universe is out there shining down on you, the Milky Way included. Beautiful. Wind as usual from the southwest. Means a blacked-out takeoff to prevent silhouetting the aircraft to Viet Cong ground fire. Darn those rascals. No moon either. Can't even see the mountaintops 4 miles away. It will be immediately IFR upon rotation.

Another night of instrument flying. Thank goodness for those Hawk instructors back at flight school. The division of attention, intense concentration, and pressure during takeoff and for about 1 minute after liftoff is tremendous. I can think of lots easier ways to work up a sweat.

First there is the blacked-out takeoff. No rotating beacon, navigation, landing or taxi lights are permitted — only the tactical runway lights. Ever try to keep a 16,000 pound hurtling object, which is gathering momentum from 0-110 knots in a relatively

short space of time and distance, on a barely visible white center line while plagued by torque from two monstrous powerplants operating at military power and crosswinds at 10-20 knots and using runway lights which only illuminate themselves and not one bit of ground? Try it on for size sometime.

You lift off. Below, somehow you see the numbers as you pass through 115 knots. You are already on those gauges. Keeping the wings level. Holding a steady climb. As soon as the vertical velocity needle starts showing a steady climb and the altimeter needle starts off the field elevation, you hit the gear handle and clean up the cockpit, turn on all lights after gaining a few hundred feet to avoid a mid-air, and initiate the standard instrument departure. Everything accomplished you make the last few radio checks with the tower and unit operations, and you are en route for your mission.

Man, I've practiced that procedure over and over. It's good and it works and we need it. In the Hawk you must have and follow procedures. Things happen too quickly, and without procedures a dangerous flight condition may result. Without a doubt the Hawk is a procedure airplane from learning how to don all that equipment to entering and exiting the cockpit and performing single engine instrument approaches.

Yipes! Only 10 minutes left. Need to get dressed quickly and hit the briefing area. Hope there's no problem with the aircraft or sensors. You know, I've often wondered how many Army people, even aviators and those concerned with aerial surveillance, know what an IR aerial surveillance mission sequence consists of. Haven't got too much time to brief them on IR operational procedures now, but I can cover them in flight planning and during flight. I could probably summarize a background of the Mohawk though. Let's see . . .

The OV-1 Mohawk airplane is a Grumman product engineered to withstand high landing stresses. It is ominously configured at the nose, looking somewhat like a mosquito, but this gives it an impressive 180° side to side view and an excellent overhead view. One can even see directly under the fuselage due to the rounded, bubbled enclosure. The triple tail is for aerodynamic design and to present a low silhouette for field parking.

Speed brakes, three quarters of the way back along the fuselage, are included on A and C models. They serve as slowdown devices for use during rapid descents (e. g., 2,000-6,000 fpm) and can also be used for various maneuvers. The engines are Lycoming turboprops; they mount three bladed, full feathering, full reversible, with autofeather and synchronizing / synchrophasing features, Hamilton standard, hydromatic, constant speed propellers.

**I've wondered how many Army people, even aviators and those concerned with aerial surveillance, know what an IR aerial surveillance mission sequence consists of**

The basic OV-1 airplane has a 2 hour and 20 minute fuel endurance, but with the addition of two 150-gallon wing tanks, the air time can be extended to about 4 hours and 30 minutes, depending of course on altitude, power settings, etc. Many of the items of equipment work off the hydraulic system, such as power brakes, steering, and the landing gear. The electrical system, as can be imagined, is complex, and that's without adding the airborne electronic sensor electrical system.

The new AN/ASN-76 compass system is very accurate and feeds appropriate data to the FD-105 Collins integrated flight system. Not yet equipped with TACAN we can rely to a degree on Air Force GCI (ground controlled intercept) radar sites for bearings and distances to designated grid coordinates. Using the RMI (radio magnetic indicator) needles on an ADF station and the Doppler en route navigator combined serves as a rough TACAN. The Canadian-Marconi Doppler radar navigator is the primary navigational equipment and is used for en route tracking and for target area search pattern and maneuvers. This complex computer displays an immediate visual destination, bearing and distance indication, and uses military grid coordinates to display present position and proposed destinations. Also available are groundspeed, effective wind, track made good, drift angle, and lateral drift error.

An automatic flight control system (autopilot) the AN/ASW-12, is necessary to conduct an operational mission and relieve the pilot of flying the aircraft so he can concentrate on navigation and perform other functions. The autopilot will track in conjunction with omni, ILS glide slope and localizer, and even Doppler navigator. It is a sound, workable system.

The OV-1 series aircraft of today are equipped with a wide array of radio communications equipment to include SSB, HF, VHF, FM, and UHF gear, all with digital tuning. Both pilot and observer have signal distribution panels and both can talk/receive on different radios simultaneously.

Navigation radios include one omni, one TACAN (to be installed), an RMI and an ILS with localizer, glide slope, and marker beacon. Preplanned approaches

**An OV-1 Mohawk on a SLAR mission five miles southeast of Vung Tau**

can be devised using the Doppler radar. A combination of stations can be selected using the integrated flight control system and the RMI needles on the TACAN-VOR-ADF selector panel.

Additionally, the aircraft has a separate oxygen capability for each crewmember and is fully equipped for weather flying with engine, prop, wing and tail surfaces deicing equipment as well as anti-ice fluid for front windows and high power, varying speed window wipers. A radar altimeter indicates altitude above the terrain and is quite invaluable on IR runs.

One of the refinements of this aircraft is the British developed Martin-Baker ejection seat, which has never failed to function properly when properly rigged and used in its design envelope. Each occupant is securely fastened by shoulder, lap and leg straps to the seat. Once in and secured, no more bold body movements can be made. Each seat has primary and secondary firing handles to actuate the ejection which is not unlike a swift kick in the pants.

The OV-1 contains the KA-30 aerial camera system in the belly, which can take 240 pictures in the vertical and/or 15°-30° oblique mode. Additional film can be carried and after landing, with one engine then shut down, only a few minutes are required to set up the camera again. It is preferable that the landing field be near a developing facility, so the first roll will be developed and available for the imagery debriefing when the flight crew returns from the second sortie.

Various lenses are available and Mohawk unit photographic scale capability will vary with the size lenses on hand (3″, 6″, 12″ or 18″). Lenses must be changed on the ground. The aircraft is capable of taking pictures at varying speeds and altitudes depending on lens, weather and terrain. Varying scales can be obtained depending on lens and altitude. Prints can be enlarged by photo labs organic to the unit. Pictures can be taken automatically or clicked off singly. The control panel is set up for the desired results and maintained throughout the run. The exposure remaining counter will indicate number of pictures left to take.

The system is capable of night photography using photo flash cartridges or the recently introduced LS-59 strobe light system. To take night photographs requires ground changing of certain switches in the electronics bay. Therefore, a day and night photo run cannot be scheduled without landing to make the proper adjustments. The photo flash cartridges demand special handling since ordnance is involved. Care in loading and arming procedures and judicious use of controls is vital, and personnel must be well versed in procedures.

Another innovation introduced in the field is the KA-60 panoramic camera. Mounted in the nose it takes a 180° wide angle side-to-side panorama of the terrain for-

ward of the aircraft. It produces superior photographs for plotting helicopter landing zones, as it presents to the chopper pilot the same picture he will see on the combat assault approach.

The OV-1B model contains that elongated black cigar under the right side of the fuselage which projects a few feet forward of the nose. Commonly called the SLAR (side looking airborne radar), its mission is to detect moving targets on land or water. The autopilot must be employed to hold the airplane on a steady track, as any deviation causes wavy lines to appear on the imagery. A true picture of the terrain, reproduced from radar echoes reflected back to the receiver, appears on the target indicators.

SLAR only indicates that *something* is moving. It does not tell *what* is moving. The system contains the RO-166 inflight processor/viewer which develops and processes the imagery in approximately 3 minutes after it is taken. Unlike the Mohawk camera which takes separate pictures, the SLAR, as does the IR, prints continually. The scale is almost 1:500,000 and the film can be directly correlated to that scale map and six digit grid coordinates obtained for inflight spot reporting to ground, Naval or Air Force fire control agencies.

The system is a near all-weather product. The SLAR can penetrate through light clouds and rain, and future refinements will improve its "seeing" capability. Many a successful SLAR mission has been accomplished flying 2 to 3 hours "in the soup" and returning with perfect imagery. The SLAR system, as with the IR system, contains a terminal ground sensor terminal (GST) which, when in line of sight of the aircraft, will receive signals and produce imagery as recorded in the aircraft. FM communications between aircraft and ground sensor terminal is always desirable.

The mission of the OV-1C (IR) is to detect targets through emission of heat radiation relative to the temperature difference of the surrounding terrain. It does this through the use of infrared detectors mounted in the belly of the aircraft. Like the OV-1B, a KA-30 camera system is installed in the OV-1C. It can be combined with IR to take a complementary image during daylight hours. Infrared is best used for short strips and small areas, as the ground covered on the imagery is directly under the aircraft.

Well let me make sure I've got all my survival, evasion and escape gear. Weapon, ammo, knife, blood chit, survival map, Geneva Convention card, shot record, ID card, dog tags and flashlight. All A-OK.

The aerial surveillance intelligence briefing was standard for this mission and lasted about 15 minutes. This briefing is not concerned with air traffic control procedures. Routing is a pilot's responsibility and flight operations provides assistance in this area. Pilots have 1:250,000 scale maps for en route VFR navigation.

Flight crew planning follows the briefing and takes 30 minutes to 2 hours, depending on the aviator's experience with the area of operations, and complexity of the mission, i. e., number and location of suspected targets, routing and control agencies involved, and number of navigation update points required. During preflight planning all air traffic control procedures are covered to include general headings, altitudes, timing , control agencies involved, navigation update points, and method of area search to include direction of pattern legs and the all-critical altitude.

Upon completing their work, and satisfied that he and the observer know the plan, the flight crew will move to the flight line three quarters of an hour before takeoff time. Meeting takeoff time and time over target (TOT) is critical as it involves artillery coordination in and around the target area(s) and target entry and departure clearance.

A still, dark ramp, broken only by the mosquito like silhouettes of the poised Mohawks in their revetments and the eerie glow of flashlights, awaits the arrival of the crewmembers. The crewchief already has the aircraft prepared for the pilot's inspection and accompanies him on his preflight. Meanwhile the sensor ground crew has checked out the sensor and reviews its status with the observer who prepares the data slide and checks the clock, both of which will appear on the film. With all flight and survival gear secured and crew fastened to ejection seats, a thorough cockpit check ensures all is ready to start the engines.

A quick throw of switches, the flow of fuel mixed with air and combined with the spark of ignition, the searing flash of flames, and the turboprops start their endless rotation and peculiar whining as they whistle through the quiet morning. After a brief wait and monitoring of engine instruments, number two is started to join number one. After a careful primary and secondary flight control check, and engine and radio checks, the light wands of the crewchief guide the Hawk out of the revetment, slowed slightly by the testing of power brakes, and begins taxiing to the runup position.

Taxiing a Hawk during daylight has its problems. It seems to want to go faster than a quickly walking man. So we feather a prop, use reverse and a little brake pressure here and there. At night it looks and feels different, so you think you're going 20 mph. While taxiing, the pilot performs many instrument system checks, and the

**The Mohawk returns just before dawn after a successful IR mission**

observer programs the Doppler computer with the grid coordinates of the airfield, initial update point and first en route update point. On performing a reverse power check, the aircraft slows down suddenly while the pilot slides the power levers into ground idle as the aircraft rolls into the runup area.

A normal night IR mission runup takes 8 to 10 minutes. A complete fuel system check, prop and pitch check, separate engine full power tests, and a complete autofeather system check completes the aircraft runup. All navigational equipment is checked with nearby beacons, the autopilot is tested in all modes and Doppler coordinates are verified. The pretakeoff checklist almost completed, the hatches close and the claw locking hooks move forward, smacking solidly into the waiting retaining rings. The ejection seats are armed and takeoff clearance is obtained.

Upon alignment with the runway, a last minute engine and aircraft systems check is made, all outside lights are extinguished and the brakes are released. Power levers are smoothly and uniformly advanced, and the two hefty T-53/L-7 turboprop 1,150 e.s.h.p. Lycoming engines deliver their thrust to launch this 16,000 pound bird weighted with 600 gallons of JP-4 into the medium of aerial flight. The airplane leaps forward and quickly gains speed. Maintaining centerline contact is a delicate balance of aileron and rudder.

A visual check is made of all engine instruments, especially power indicating gauges. Speed rapidly approaches 60, 70, and then 80 knots. Sitting almost 10 feet high and right up front, the lights rush by at an amazing speed and soon the clarity of each light is blended into the blurry sight of a continuous succession of lights. Soon 90, 100, and finally 110 knots. The plane is very light and with some back pressure is lifted into the softness of the cool night air.

Complying with the SID a climbing left turn is made to a heading of 060°, leveling at 1,000 feet MSL heading out over the South China Sea. The pilot squares the aircraft away, attains cruise airspeed, trims up the control surfaces, and engages the autopilot. Meanwhile the observer has turned on his IR sensor and makes minor adjustments. The pilot contacts approach control and makes his request: "A 1,000-foot low pass over the runway to update the Doppler, east to

west with radar monitoring for flight following and separation, squawking 04, flashing now, right climbing turn to 4,000 feet proceeding north." "Roger" was the reply to include current altimeter setting. While under positive radar control the pilot maneuvers the craft around the pattern, updates the Doppler over the numbers, and commences his climb.

Leaving the radar controller when out of range the pilot transfers to another approach control facility and makes another Doppler update as the observer gives a last minute sensor check. Checking into the supported unit tactical net the pilot is cleared into the target area. He climbs to the target altitude — 1,000 to 2,000 feet above the highest terrain and maneuvers the plane to a line on the previously determined search pattern. Up and down, back and forth, 12 passes, 7 minutes a pass, over approximately a 30 km by 10 km area. Purpose of mission: to locate elements of a VC division. Targets were reported to the supported unit G-2 air on FM, using the Doppler coordinate readout. Artillery strikes would hit the six digit locations after the Hawk cleared the area.

Completing the run the pilot signs off and flies to target number two, using GCI radar to approach the general location and Doppler to find the exact target area. However, he finds that artillery could not be lifted due to intense enemy action. As he has only 2,000 pounds of fuel remaining, his wing tanks having just gone dry, he decides to head home and run a local area target, working with approach radar for continuous coverage on a local frequency for spot reports.

There wasn't much jet traffic so approach control issued position reports every 10 minutes and everything worked beautifully. After finishing the last leg and down to almost 600 pounds the pilot ended the mission by allowing the observer to make an autopilot GCA to the air base, took over on 2 mile final and landed.

Landing roll completed, the pilot cleaned up the cockpit and called his down time to unit operations. The IR ground crew monitored the radio call, and their alert vehicle was already on the way to the ramp to remove, tag, and get the imagery processed at the photo lab. The flight operations dispatcher meanwhile had alerted the G-2 section of the landing. They would prepare the debriefing.

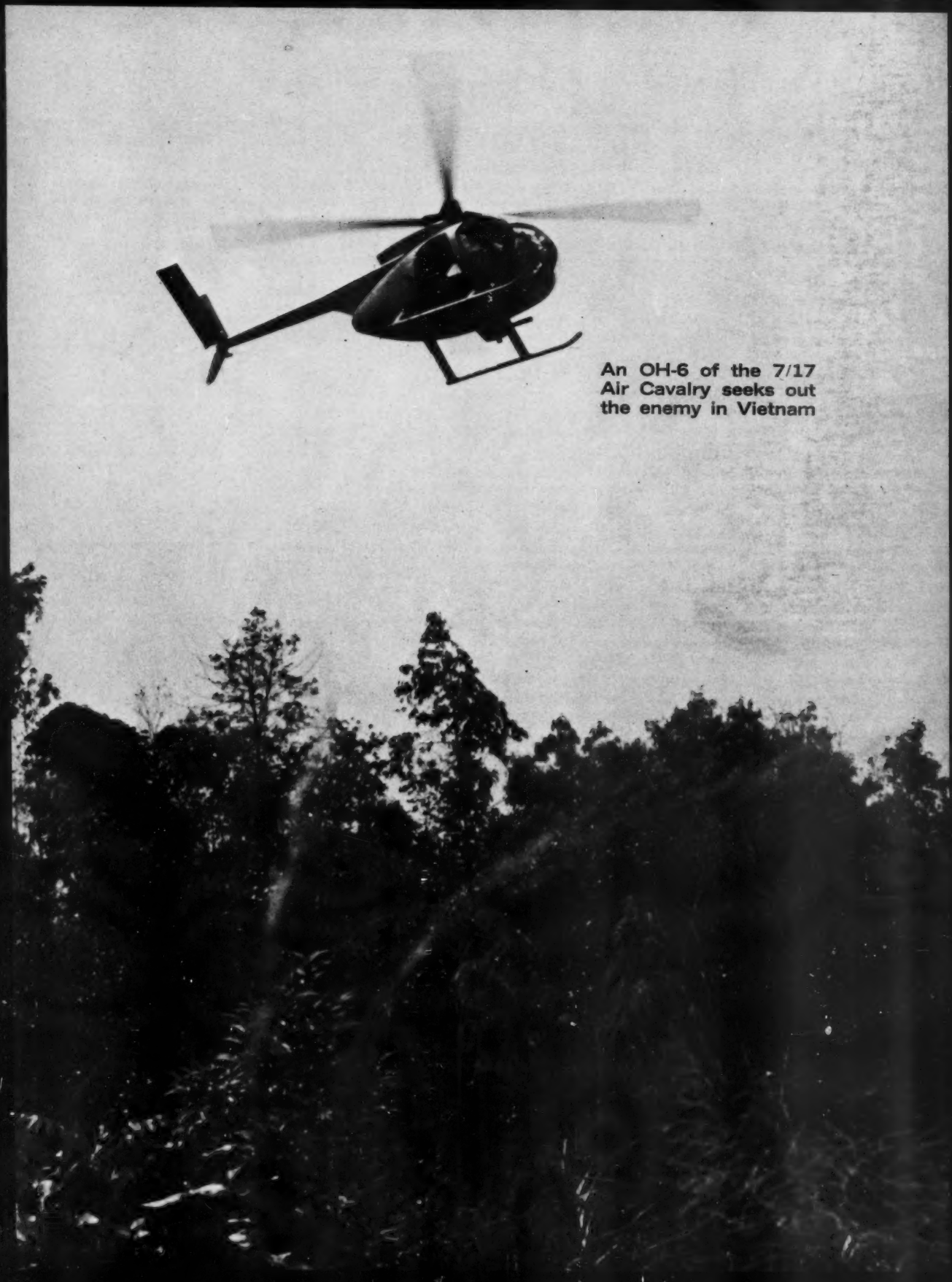
Soon the flight crew arrived at operations and received a standard intelligence debriefing. A form designed for the unit operations and requirements was filled out to be a part of the mission folder and filed for future use. A pilot's trace was prepared and after a snack break the crew returned to the tactical imagery interpretation facility (TIIF) to view their imagery. Resolution was good and plotting no problem as they had extended the pattern to include a stream on one end and a road on the other end. Coverage was 100 percent with overlap on several legs. The Doppler was working well this night.

The flight crew departed and left the imagery specialists to do their detailed plotting. The pilot's and observer's job was done. Maybe in a day or so the unit liaison officer at Field Force HQ would get word from the supported unit of the results of the artillery strike. That's in the nature of the intelligence job.

The time was now 0700 hours. The sun had just come up; it was the start of a new day. Another routine but successful IR aerial surveillance mission sequence has been written. It had taken 6½ hours of planning and flying for the flight crew to accomplish their portion; it would take the imagery interpreters several additional hours to close the story on this mission.

As the new day begins and our IR lads go to sleep, visual photo ships will begin operations. Testing of sensors and Dopplers will begin and aircraft maintenance officers will want to examine aircraft and engines. As the sun sets and the daylight draws to a close IR operations will begin again. So too with SLAR. And so it goes — day after day after day.

That's the challenge to the OV-1C Mohawk IR crew. They fly at night, under VFR and IFR weather conditions, covering all suspected targets in the Corps area, operating over hostile territory under numerous artillery and flight control agencies, and at remote distances from home base and friendly units.



An OH-6 of the 7/17 Air Cavalry seeks out the enemy in Vietnam

# So You're Headed For An Air Cavalry Squadron

**Air cavalry is no more a mystery than horse or armored cavalry. It simply is another step in the development of cavalry concepts which the author discusses below**

**Major William Bedsole**

"MOUNT UP and move out" has been heard in Cavalry circles throughout military history. The only thing that has changed over the years is that the men now mount vehicles instead of horses.

Early cavalrymen depended on horses for mobility, and there still are a few old timers around who can really get nostalgic when horse cavalry is mentioned. But, as is always the case with progress, horses became obsolete and were put out to pasture when ground vehicles came along. For the logisticians, gasoline replaced hay.

While ground vehicles have not become obsolete, as was the case with horses, something has come along that in most cases can do a better job — the helicopter. Helicopters probably will never completely replace ground vehicles in cavalry units, but they already have brought changes in tactical concepts, causing many of us to fall behind in our knowledge of cavalry concepts.

Mainly because of the relatively small number of air cavalry units, today's aviators are often perplexed when assigned to such units. What is it? where did it come from? what does it look like? and what will I be doing? are some of the more frequent questions asked.

The term air cavalry is fast becoming firmly affixed in military vocabulary. To many it is already well established, but to some it means several different things which are not completely accurate. Air cavalry does not particularly mean the 1st Cavalry Division (Airmobile). And it is not the "Sky Cavalry," an earlier designation for an air cavalry unit. Simply stated it means a unit which uses aerial mobility to perform the missions of reconnaissance and security — missions which heretofore have been performed by armored cavalry units using ground mobility.

Air cavalry had an early beginning when soldiers first soared over enemy lines in balloons to get a look at the enemy's defenses. Then along came early fixed-wing Army aircraft and soldiers really became airborne. None of these events really started air cavalry, but they did start the idea.

Finally, in the early 1960s, the Howze Board, studying tactical mobility requirements, provided the needed push and the air cavalry was on its way. Plans called for each conventional division to have an air cavalry troop organic to the division reconnaissance squadron. Provisions were made for organizing air cavalry squadrons composed of three air cavalry troops and one ground cavalry troop to be assigned to airmobile divisions. Basically the air cavalry troop is organized the same whether it is located in a conventional division or in an airmobile division.

The basic organization of an air cavalry troop consists of a troop headquarters, a scout platoon, a weapons platoon, an aerorifle platoon, and a service platoon.

Perhaps the use of a hypothetical combat situation will best describe what you may be doing when assigned to such an organization.

Let's begin with a setting where we find an air cavalry troop supporting an airmobile division brigade. The brigade is on a search and clear operation and the air cavarly troop has the mission of screening the brigade boundaries and reconnoitering throughout the separate maneuver battalion areas.

Currently two scout teams are using two LOHs for reconnaissance. One team is in each of the two battalion areas. Two weapons platoon teams with two Hueys each alternate time on-station, screening the brigade boundaries. The aerorifle platoon is strip alert at the troop laager area, ready to take off on a moment's notice. The aerorifle platoon has a normal 36-man rifle team and five lift aircraft.

So far during the operation no significant activity has been observed and, as usual, the scout aviators are becoming restless at finding no enemy. Suddenly, a spot report cracks through the silence over the operations radio.

"This is bear one-one, spot report. Over."

The operations officer answers, "This is bear three. Over."

"This is bear one-one, echo kilo eight six two niner eight zero. One zero personnel in khaki color clothing with shoulder weapons hiding in brush. Continuing to observe. Over."

"This is bear three, roger, wait. Out." Turning to the troop commander to be certain he has heard the report, the operations officer then passes the report to brigade S-3.

Knowing what the brigade commander must be thinking, the troop commander alerts the aerorifle platoon commander and the weapons platoon commander to prepare for a quick scramble. The weapons platoon in an airmobile division combines the weapons sections of the scout and troop found in a normal division to provide aerial weapons firepower. It uses 10 armed Hueys.

The operations officer hasn't had time to pass on further instructions to the scout team when, suddenly, "Bear three, this is bear one-one. Receiving small arms fire from last area reported. Returning fire; request weapons team. Over."

"This is bear three. Weapons team on the way. Continue to observe but don't get overcommitted. Out."

As if already planned, the brigade S-3 calls and informs the troop commander to contact the battalion in the sector of reported activity and develop the situation further.

The troop commander, while his copilot is warming up the command and control aircraft, calls the platoon leaders and operations officer together and runs over the potential courses of action.

His orders are that the weapons platoon will continue to screen the brigade boundaries and will maintain one team in the area of the sighted personnel. It will not be necessary to continue on-station relief on the screen. The scout platoon will continue to reconnoiter the battalion areas, and the aerorifle platoon must prepare to take off on order to air assault and reconnoiter the vicinity of the sighted enemy.

After taking off and heading for the area where the scout team reported the enemy sighting, the troop commander establishes radio contact with the 1st Battalion commander — the battalion responsible for the sector where the enemy was sighted.

Knowing where 10 personnel were sighted, there probably will be at least a full platoon, the troop commander requests the battalion commander have a relief force for backup, just in case the rifle platoon needs assistance after landing in the area.

The battalion commander acknowledges his request and informs him an infantry rifle platoon is on 15-minute standby and an infantry company can be placed on the ground within 30 minutes of notification.

Guided by the scout team already observing the enemy, the troop commander picks out a small clearing 200 meters from the spot where the enemy was sighted, encodes the landing zone location and radios it back to operations with instructions to get the aerorifle platoon on the way.

Just now the weapons team, requested by the scouts when they received fire, arrives. The troop commander alerts them to provide, on order, aerial weapons support for the aerorifle platoon's air assault.

Following a speedy artillery preparation adjusted by the troop commander, the aerorifle platoon commander calls, "This is bear three-one. Approaching five west. Over."

The troop commander replies, "This is bear six, roger. Continue zero niner zero, follow my instructions. Over."

The weapons team and the aerorifle platoon's five aircraft rendezvous a mile west of the intended assault location and the troop commander guides the assaulting aircraft to the LZ while the weapons team provides a landing zone preparation on both flanks of the landing aircraft.

So far not a round has come up from the intended LZ. No problems landing, and the aerorifle platoon sets out on foot toward the suspected enemy position. The troop commander reports to the 1st Battalion commander and radios troop operations to make certain the weapons platoon commander maintains a team over the aerorifle platoon. He then informs the scout team, which has been screening out to a distance of 1,500 meters around the landing zone, to continue with their former mission of reconnoitering for the 1st Battalion.

The mission is completed without incident, and the 10 enemy troops, who were the remainder of a larger force defeated in a previous battle, are taken prisoners. The aerorifle platoon's lift aircraft once again drop into the landing zone and the troops and prisoners are flown back to headquarters.

Where will you fit in the picture? You can practically take your choice of troop assignments. Frequent personnel changes, individual aviator's requests to get diversified flying, and the troop commanders' desire to cross-train whenever possible assures you of finding the spot to fulfill your own flying desires.

Basically, the air cavalry is no more a mystery than was horse cavalry or armored cavalry. Today's aviator should feel confident when he finds he is headed for an air cavalry troop or squadron. He is about to become a part of one of the most colorful, fastest moving and most effective units in today's aviation and the United States Army.

# Night Thievery

Major Howard J. Stiles

THE AIRCRAFT commander gave a "Thumbs Up."

"Clear." I punched the clock, triggered the starter, and the rotor blades started turning. I glanced at the gauges. Everything was normal, except it was 2230 hours. This was a night combat assault.

Earlier, as dusk was falling, we had inserted our pathfinders into two landing zones along with a security force. Two separate flights of six UH-1Ds proceeded low level and made three touchdowns. On the second touchdown, the security force and pathfinders exited the aircraft. They ran for the treeline, and clandestinely went about preparing the LZ.

Liftoff to the pickup zone was 2235 hours. Soon the troops were loaded, and 24 Deltas were whirling their way toward VC infested territory. The moon cast shadows as it danced behind the clouds; however, navigation was not difficult. Checkpoint one passed underneath, soon checkpoint two, and up ahead I could see the flaming arrow at the release point.

Making my turn, I called "Pathfinder Blue, Bulldog lead inbound."

My headset crackled with the reply. "Roger, Bulldog Lead. LZ secure, wind 120° at 4 knots. Do you see the light?"

Cutting through the darkness was a narrow beam of white light. Right on course. "Roger, Pathfinder Blue. On course, 3 minutes out."

I eased down on the collective and my heart started throbbing. We established our glidepath. I glanced out the side window to the rear. To my comfort, number two was right in place.

I could not see the beanbag lights. I could feel the strain of my eyes as I scanned the darkness. Suddenly, like pearls on black velvet, 12 touchdown points shimmered in the darkness.

We were on the ground. The crewchief and gunner gave an "up" and we were airborne again. Slicing through the darkness, we gained altitude and returned to formation.

I settled back a little and relaxed. One more lift.

On the second lift we extracted the pathfinders and headed home. As we flew high over the rice paddies of Tuy Hoa, the moon raced from paddy to paddy to keep up with us. I felt relaxed and content. Not a hitch in the operation; I was proud of our pilots. Like thieves in the night, we were stealing the darkness from Charlie.

# Aboard the Mohawk in Vietnam

**An Army aviator writes about the inspiring labors of his observer — labors that are common among enlisted crewmen**

**Major Donald A. Roberts**

NUMEROUS OV-1 Mohawk units, known as Surveillance Airplane Companies, support the ground troops in the Republic of Vietnam. One unit with these triple-tailed, twin-engined, turboprop aircraft is the 245th Surveillance Airplane Company.

At 1830 hours on 25 March 1968, a Mohawk from the 245th SAC rose into the sky from its home in I Corps. The crew of two, pilot and observer, started a normal surveillance run in the south end of A Shau Valley and proceeded north to Khe Sanh. As the aircraft then travelled along the DMZ, the technical observer, SP5 Kevin Ward from Newbury Park, Calif., observed a surprisingly large number of vehicles traveling southeast from North Vietnam on highways 1A and 101. He quickly plotted their exact position and called in the coordinates, first to a fire direction center for an artillery strike, then to an airborne control ship for an airstrike.

In a race to fire upon this lucrative target, the artillery battalion won. They closed the area to aircraft as they pumped high explosive shells all along the road. There was a very low cloud cover, but the 245th SAC crew could still observe the fireballs illuminate through the clouds. Numerous secondary explosions occurred and the glow from the burning vehicles lingered throughout the night.

There were so many land and water vehicles moving toward

South Vietnam, it was evident this would be an unforgettable night. To assure maximum time on target, Specialist Ward asked the pilot, MAJ Donald A. Roberts, to reduce power to conserve fuel. The flight paths were short and slow cruise would be a better choice, so the pilot responded immediately.

After numerous airstrikes and artillery barrages, all movement stopped for the moment. Specialist Ward had taken a spare moment to update the computer of his Doppler navigational equipment. He programmed a route that would lead the aircraft by Hue Citadel, the city that was lost to the enemy for a short time during the last winter-spring offensive. He efficiently checked all enemy movement in this area.

During the flight, Ward encountered many maintenance problems with his surveillance equipment that would have flustered the average technical observer. He came up with spare parts, string, bits of wire from what appeared to be an unending supply source in an already small, cramped cockpit. In each instance he restored life to his equipment in record time, and this span of time could not have been shortened even in an air-

**Above: Specialist Kevin Ward prepares to preflight his Mohawk**
**Below: Specialists Charles F. Simpson (left), Ward (center) and Huey S. Harrison interpreting imagery in the operations building**

**Specialists Kevin Ward (left) and Daniel L. Parker working in the avionics van**

conditioned avionics lab back behind all enemy movement.

After passing A Shau Valley several times and stopping all vehicles with airstrikes, Specialist Ward suggested an alternate flight path that would cut across the valley in just the right spot to pick up vehicles that might be hiding behind the shadows of mountains. On the first pass using the new flight path, what had appeared to be a quiet, motionless stretch of road now was bustling with activity — vehicles that were sneaking around the hills toward A Shau Airstrip.

With the same uncanny speed, Ward plotted the beginning and end of each string of vehicles and also picked out the stragglers. He used the same efficiency in directing airstrikes on his targets. Major Roberts sat beside him feeling useless as the man in the other seat plotted targets, directed airstrikes, adjusted artillery, and fed new coordinates into his Doppler navigational equipment. This untiring precision continued in the Khe Sanh area.

After being over the target area for almost 4 hours, thanks to the fuel saving advice of Specialist Ward, the Rapid Data Processor quit functioning, having expended all of its precious film processing liquid. The airplane that was to relieve this crew was late due to maintenance difficulties. The controlling agency at Dong Ha begged the original crew to stay and continue to observe the boats in the South China Sea departing the north to enter the mouth of the river just northeast of Dong Ha.

In an unprecedented move and with creative insight, Specialist Ward sprang into action. He found a long plastic tube that houses spare data processor rollers. With it he sucked up the used chemical out of the waste tank, quickly placed his finger over the top of the plastic tube, and untiringly transferred numerous small loads of chemicals into the supply tank. He had no way of knowing if the expended chemicals would work a second time or what consequences he might suffer if he accidentally swallowed some of this liquid. He knew it turned his flight suit and hands a brown color as he accidentally spilled a few drops.

In very short order, he had his equipment functioning as before and he continued his tasks until the relief ship arrived on station.

Subsequent relief crews were to benefit throughout the night; Specialist Ward had alerted all ground stations that during this night plagued with miserable weather Charlie was on the move.

This crew had flown together on numerous occasions and it was expected that the technical observer would now reach across the radio console and with the autopilot turn the aircraft toward home, while the pilot was busy checking the weather and tuning in navigational beacons.

When the pilot finished his duties, he sat back and observed this man, who had not been school trained in flying but had chosen to become proficient on his own. Major Roberts watched Specialist Ward make the necessary turns, descents and power adjustments that would bring this long flight to an end. They had been airborne almost 5 hours and the pilot settled back to fill out the logbook.

The airplane was still VFR on top, and the pilot knew from past experience the technical observer knew the function and importance of each engine instrument and flight instrument. He also knew Ward had practiced on numerous occasions with the autopilot and had flown the aircraft in marginal weather using a ground control approach. It always resulted in an outstanding termination. This valuable experience is necessary in the event the pilot becomes incapacitated from enemy ground fire. Major Roberts let Specialist Ward continue the flight while he conserved his energy for the night landing.

The pilot marveled at the untiring energy of this 19-year-old man. It was no wonder this particular technical observer was put directly in charge of 22 men who were up to 15 years older than he. Specialist Ward supervised his men and maintained the most sophisticated electronic sensor equipment in the United States Army inventory as if he had 17 years service instead of 17 months.

**Part of Specialist Kevin Ward's duties include working in the film lab. Here he and Specialist Rinus Mulder (right) develop film**

After returning to the home airfield, the familiar war stories filled the air as the pilots bragged of their daring feats. The technical observer knew he had several extra hours ahead of him cleaning his equipment and assisting the image interpreters. Specialist Ward continued his duties in the same professional manner, even though he had supervised his crew from 0600 hours the preceding day and now it was 0300 hours a new day. He felt he had received all the reward necessary when on the way to his quarters the pilot briefly said, "Thanks for a good flight."

**. . . above all things, the lasting tribute to the spiri**

**Captain Matt**

A WEATHER SHIP searches the skies of Vietnam at 0400 hours. Artillery rounds flash sporadically in shadowed rice fields far below while a dark mass slowly gathers, billows, and soon looms eerily over the landing zone. In an operations bunker northwest of Saigon, an air mission commander receives reports from the airborne weather crew before committing his airmobile assets to a long day of war. Within minutes he boards a command and control aircraft carrying an airmobile task force commander and proceeds aloft to guide the conduct of the assault.

In a base camp pickup zone not far away, 60 crews ignite the turbines of their helicopters. Darkness still shrouds the aircraft as ground troops, mounting the waiting lift ships, lean against the bulkheads, nervously hoping for a final rest before reaching the landing zone.

The slick ships rise slowly in sequence and tilt forward, their rotors straining to lift the heavy loads over the thick canopy of trees which now too rapidly approaches the dimly lit cockpits. Some apprehension, a hopeful pull for more power, a tightness in each pilot's stomach as his skids brush through the treetops, and then relief as the flight lifts and all ships are reported airborne. Another day thus begins for the 269th Combat Aviation Battalion, Vietnam's BLACK BARON Battalion.

Activated for deployment to Vietnam at Fort Bragg, N. C., in July 1966, the 269th arrived in the Republic of Vietnam in January 1967. Designated as the primary aviation support battalion to the 25th Infantry Division, the 269th consistently has been committed to the execution of airmobile operations in major exercises conducted in the III Corps tactical zone. This included airmobile insertions of U. S. Forces into the landing zones of Junction City II, Kole Kole, Diamondhead, Barking Sands, Manhattan, Atlanta, Yellowstone, and innumerable other significant operations.

Heavily committed in the terrain of war zone C, the Parrot's Beak, the Iron Triangle, and Hobo Woods, the 269th has earned many distinctions. The employment of Black Baron aircraft in these hotly contested areas, however, has taken its toll. Considerable damage from hostile fire was inflicted on 269th ships in a span of six months, but most of the aircraft were either able to return under their own power or were recovered by CH-47s.

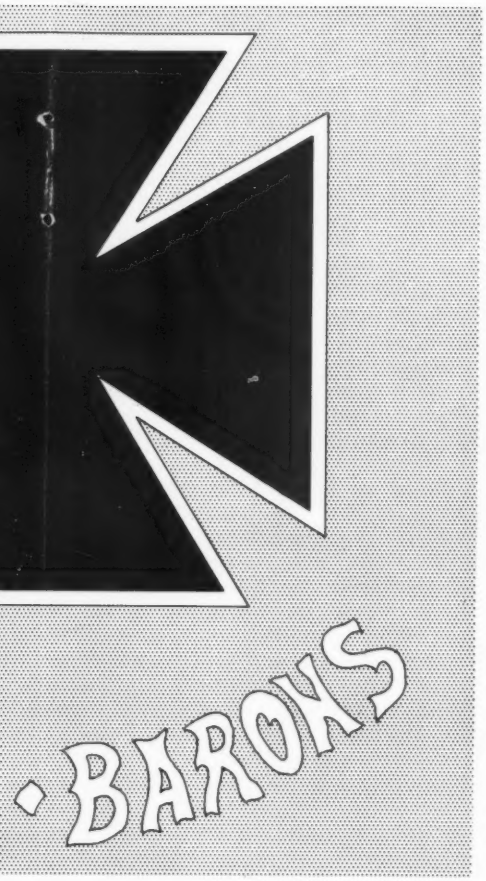
Battalion headquarters for the 269th is located at Cu Chi, 30 miles northwest of Saigon. This also is the base camp of the 25th Tropic Lightning Division. In fulfilling its tactical missions the 269th has six subordinate units: a headquarters company, three assault helicopter companies, one assault support helicopter company, and one reconnaissance airplane company. The assault helicopter company base camps, strategically located to afford the best tactical support to each of the three brigades of the 25th Infantry Division, span the entire western breadth of the III Corps area.

The airmobile companies are better known in their tactical environments as the Hornets (116th), the Blackhawks (187th), and the Black Widows (188th).

Each is basically comprised of troop carrier helicopters and gunships, both of which are models of the famous Bell UH-1. All the aircraft are armed for protection.

The gunships, however, as primarily offensive machines, are heavily laden with varied ordnance systems. Included in the arsenal are 20 mm and 40 mm guns, 2.75" and 3.5" rocket launching systems, and 7.62 mm miniguns. Each assault company has on numerous occasions been subjected to some of the heaviest fire Charlie could deliver. This includes automatic weapons, RPGs, and mortars.

The Black Baron CH-47 unit, known as the Muleskinners, is the 242d Assault Support Helicopter Company. Flying from Cu Chi, the crews of these medium cargo helicopters resupply forward field positions with rations, heavy weap-




## e Black Barons seek to be a rit of Army aviation

thew R. Kambrod

ons, ammunition and other forms of logistical requirements. The hugh Chinooks also have inserted and extracted large troop units. The true value and capability of the CH-47 greatly expands the resources of the Black Barons.

The battalion's fixed wing unit, the 21st Reconnaissance Airplane Company, the Black Aces, located at Tay Ninh, provides a visual reconnaissance capability to the many units in the III Corps area. Day and night the low drone of an 0-1 can be heard above as pilots and observers methodically search the ground for the elusive enemy. The capability of these crews to call for and control artillery barrages makes the Bird Dog one of the most formidable and deadly weapons in Vietnam.*

The 269th also has its own specially modified smoke ship, "Smokey Baron." This aircraft is used extensively on all airmobile operations, be they battalion or company size. Daily, Smokey can be seen shuttling from one operational area to another in support of the battalion's aviation elements.

Upon request from infantry ground commanders, smoke screens have been laid to support an infantry ground move or to assist an urgent medevac. Denying the enemy a point target, the smoke ship has substantially decreased the number of aircraft losses normally assessed as damage from enemy fire. In fact, as of this writing, no aircraft has been shot down in a landing zone which was smoked by Smokey Baron.

The aviation battalion has an organic pathfinder detachment, the Cavaliers, assigned to it. This unit provides navigational assistance and terminal guidance to all of the battalion's aviation elements. Primarily, however, pathfinder personnel have been used in the control of infantry elements in pickup and landing zones. Normally inserted into forward field locations hours before an airmobile operation, pathfinders have been responsible for ensuring the correct placement of loads in suitable locations for an airmobile pickup. They have also been heavily committed to the control of logistical moves by Chinooks. The successes achieved by the 269th in the conduct of airmobile operations has in no small measure been due to the efficiency of its pathfinder personnel.

The Black Barons conducted their first combat assault on 14 April 1967. Today the unit has participated in 46 battalion-sized and hundreds of company-sized combat assaults. Its operations have supported not only the U. S. 25th Infantry Division, but also the U. S. 1st and 9th Infantry Divisions, the 199th Light Infantry Brigade, the 5th U. S. Special Forces Group, the 1st Australian Task Force, and the Tiger and White Horse Divisions of the Republic of Korea Army.

Black Baron airmobile operations have required the frequent attachment of complete aviation battalions, placing over 100 aircraft in the air at one time in the conduct of a combat assault. In fact, on the 42d battalion operation more than 100 UH-1s and 30 CH-47s and CH-54s were used in what was probably the largest airmobile assault ever conducted.

While individuals may readily be identified for their achievements, the full success of the battalion, however, must be attributed to the men who form it and have fought and continue to fight to make it what it is.

The 269th strives to be more than just a unit in Vietnam. It urges a constant endeavor toward professionalism and further excellence. A belief in the certain success of a disciplined unit.

Above all these things, however, it continually seeks to be a lasting tribute to the spirit of Army aviation in the Republic of Vietnam.

The Black Barons can best be summed up by their motto and the goal of every man assigned—AIM HIGH.

*Since this article was written the 21st and 188th have been transferred from the battalion.

# Chinook Recovery Mission In Vietnam

CW3 James G. Miner

SINCE THEIR ARRIVAL in Vietnam, CH-47 Chinook aircraft have recovered and returned to service or salvage hundreds of aircraft. Although the majority of these aircraft were UH-1 Iroquois, the Chinook has also recovered CV-2 Caribou, Chinooks, Navy and Air Force A-1Es and Vietnamese CH-34s.

A simple and fast recovery technique has been worked out. When an aircraft has gone down, whether from enemy action, maintenance failure, or pilot error, the unit maintenance officer goes to the site and determines whether the downed aircraft can be repaired on the spot and be flown out. He takes into consideration such things as amount of work required to repair the downed aircraft, security of area, accessibility of area, and the amount of time available.

If he determines that the best way to get the downed aircraft out is by Chinook, he calls for the recovery team to rig the aircraft for extraction. The CH-47 comes in on call from the recovery team,

hooks up to the downed aircraft and moves it to the nearest safe area where maintenance facilities are available.

The recovery team consists of the Chinook with a crew of five and the UH-1 Iroquois with a crew of six — pilot, copilot, crew-chief and three recovery men who rig the downed aircraft.

The equipment of the recovery crew consists of tools to remove rotor blades if necessary and various types of slings designed to be used on downed aircraft in different configurations, such as with the main transmission torn out. Also they carry about 100 feet of cable in case the aircraft has gone down in high brush or jungle.

It usually takes about 10 minutes to rig an intact aircraft and get it ready for the CH-47 hookup. The guns and radios are removed, cyclic and collective tied down, and main rotor blades are secured along the main axis of the aircraft and parallel to the ground with a locally made saddle that fits over the tail boom. Also four regular cargo tiedown straps are used to help secure the blades in place. A 6-foot nylon strap is fastened to the lifting eye on top of the mast and the aircraft is ready for hookup.

The Chinook, which has been orbiting over the pickup site, comes in on call. It comes to a hover over the downed aircraft. Hookup men on top of the downed aircraft hook the loose end of the sling strap through the cargo hook on the Chinook, then leave the downed aircraft and run to the recovery Iroquois which is running and ready for takeoff.

The Chinook takes off with its sling load and the recovery Iroquois follows, its pilot keeping the Chinook pilot informed on how his sling load is carrying. He warns the Chinook pilot if any unusual oscillations, swaying, or yawing of the slung aircraft starts.

An intact recovered Iroquois can normally be carried at an airspeed between 60 to 75 knots. If the windshields have been broken out or the tailboom broken off, the recovered aircraft tends to oscillate very badly and can normally only be carried at about 40 knots. At higher airspeed the load could swing up into the Chinook and cause serious damage.

When the two recovery aircraft get close to their destination with the downed aircraft, the recovery Iroquois goes on ahead and lands. Then the UH-1 guides the Chinook into its landing site, using radios, smoke and ground guides to get the damaged aircraft on the ground safely and on the desired spot. Iroquois with skids knocked off have been set down on sandbags without further damage to the aircraft.

The UH-1 presents no weight problem to the Chinook. Iroquois have been lifted out of jungle with trees about 80 feet high by using a 100-foot cable. They have also been lifted out of confined areas which required climbout at angles of 60° or more, over 100-foot barriers.

To recover a CH-34, the blades, radios and guns are removed and the CH-34 is ready for pickup. If time permits, fuel is also drained to help cut down weight.

The recovery of A-1Es requires quite a bit more work to get the weight down from around 15,000 pounds to an acceptable 9,000 pounds. The engine, propeller, radios, weapons, armor plate, and fuel must be removed.

Several Caribou have been recovered so far. One of them was recovered and moved over 150 miles to a port to be evacuated Stateside. The Caribou was stripped down to around 9,000 pounds by removing every part that could be removed. After the fuselage was completely stripped, a special sling was built and fastened to the engine outboard nacelles. Three days of work was required for the recovery team to strip the Caribou. Then it was moved in five loads to its destination — one sling load (the fuselage), and four internal loads, engines, landing gears, wings, stabilizer, tail fins, etc.

A Chinook was also recovered by Chinook. Again it required that the Chinook be stripped almost completely from a weight of around 18,500 pounds to around 9,000 pounds.

A special sling designed by Vertol was fastened to the forward and aft transmission mounting points. Then a drag parachute was fastened to the aft end of the stripped Chinook and it was successfully moved 20 miles to a safe area.

Some of the problems encountered during the first months and their solutions follow:

The tiedown straps holding the blades in place broke, allowing the rotor blades to start rotating. The recovered Iroquis had to be dropped to prevent damage to the Chinook. A saddle was developed to help hold the blades and the number of tiedown straps was increased from two to four.

Aircraft were lost when either the clevis through the lifting eye or the lifting eye broke in flight. Safety straps that went under the blade cuffs were devised to take the load if the lifting eye or clevis broke.

Several aircraft were lost in trying to move them from one safe area to another so that maintenance could be performed. A firm policy had to be made that no aircraft would be moved from one safe area to another unless major repairs were required. One aircraft that needed only an engine change was lost when a sling broke. Another that had been flown over a PE was lost in taking it to its home field when the Chinook carrying it lost an engine and had to jettison it to save the Chinook.

**CRASH SENSE**

*the following 28 pages prepared by the U. S. Army Board for Aviation Accident Research*

*From Army Aviation Safety Course*
*University of Southern California*

# JUNGLE TREK

AS I PULLED MYSELF out of the water into the inflated life raft — on the fifth attempt — I gave a silent prayer of thanks that the canopy release locks on the parachute harness had been in good condition. I'd heard they could rust and corrode, preventing release of the parachute, and I thought of the consequence — my body sail-planing above, on and under the water behind the wind-driven chute canopy, until I drowned. That hazard hadn't materialized. What others were awaiting as I paddled to the nearby shore, beyond which all I could see were the multitiered canopies of South American jungle?

I recalled, from classroom survival instructions, that it was wise to remain near the area in which you went down. From the "roger" given by my home base when they received my distress call, I figured it wouldn't be too long before I saw some rescue aircraft overhead. The problem was, as I arrived at the shoreline, I found the jungle started immediately, leaving no open areas from which to signal. With nightfall less than an hour away, I decided it would be foolish to paddle the raft back out into the water. My jungle trek began.

I decided I would travel in the general direction of an elevated area I had seen before entering the

water. As night fell, I stopped. I hacked away a small clearing in the jungle and made parachute canopy panels into a hammock, then fashioned a thatched cover from palm fronds. I used the contents of my survival kit to supplement the diet afforded by jungle coconuts, fruit, and vines.

At dawn, I continued toward higher terrain. My survival radio appeared to be in good condition and I was eager to give it a try as soon as I could find an open area. I heard no search aircraft, only the sounds of the jungle, broken by periods of eerie quiet. Near the close of the second day, I sighted high ground through a break in the foliage. My pace was slow because of the extreme humidity and the laborious and muscle-wearying task of chopping a trail through the undergrowth with my machete. I made a shelter for the night and foraged for food from nearby trees and stalks.

On the third day, I arrived at a clearing large enough for a rescue helicopter. After 3 hours of futile attempts to make radio contact and shooting flares every time an aircraft appeared on the horizon, I heard a welcome sound — the "flap, flap, flap" of rotor blades.

As the sound approached, my first thought was about getting out of my jungle-crudded flight suit, into a hot bath, and to a home-cooked meal. Muscling these thoughts out of my mind was a torrent of others — ideas, feelings, and conclusions about what had proved one of my most enlightening experiences. I felt I had collected enough survival lessons to provide food for thought for years to come.

The first lesson had been the importance of surmounting the worst threat to survival — the hazard spelled F-E-A-R. Our survival instructors had stressed the importance of remaining calm, thinking out a plan of procedure, and giving full consideration to local hazards and favorable conditions before making a decision. Other teaching points were equally well made — the importance of the proper use of available equipment, taking advantage of surroundings, and an undiminished confidence in eventual rescue.

Regarding fears, mine pertaining to the jungle's creatures had been pretty well dispelled. The snakes I saw always seemed to be going the *other* way, as though I was an intruder (which I was) and frightened them more than they had any intention of attempting to frighten me.

Doubts I'd had about the jungle profusion of edible plants and fruit had also been quickly dispelled. I concluded that it must be well nigh impossible to starve in the jungle. Succulent delicacies were rare, but life-sustaining vitamins were in plentiful supply.

Survival gear? Never again would I cast a disparaging glance at that beautiful bundle which I had, on occasion, left behind to carry a few more pounds of cargo. My preflights will always include assuring that survival equipment, appropriate to the mission, is aboard and positioned for easy access. Its care and use will be the most tender, loving kind.

The helicopter hovered into view to pick up our small group — the latest contingent of students of the U.S. Air Force aircrew jungle survival course conducted at Albrook AFB, Panama Canal Zone. We had completed the final practical exercise of the course. Our instruction had begun with a week of classroom work, dealing with survival in the tropics. The practical application started with each student being pulled through the water by a power boat, with parachute risers attached to his harness, to demonstrate and practice the correct procedure for releasing himself.

True, the importance of a resolute confident attitude when faced with an actual survival situation had been masked somewhat by the school environment. We had participated in small groups, rather than on an individual basis, during our jungle trek. But this did not lessen the challenge of learning to subjugate our fears of the unknown. All I learned contributed greatly to an increased peace of mind in subsequent missions over the jungles of Latin America and Vietnam. As an aviation safety officer, I hope to contribute continuing emphasis and training in the use of survival equipment and the principles of survival. All, of course, with the hope I won't have to practice what I preach.

# COLLATERAL INVESTIGATIONS

COMMENTS ABOUT the end of the article entitled "A Little Fuel Problem" in the July 1968 issue (pp 36-47) indicate misconceptions about the differences between *aircraft accident* and *collateral* board investigations. These differences are clearly defined in chapter 8, AR 95-5, which states:

**8-1. General.** It is important that all personnel concerned understand the difference between an *Army aircraft accident investigation* and a *collateral investigation;* otherwise, the purpose and effect of the two separate investigations are lost. The collateral investigation board (see AR 15-6) is convened for an entirely different purpose than the aircraft accident investigation board. It is designated to serve as a fact-finding body to compile information or data pertaining to the accident which can be used by the Army for any purpose other than accident prevention. This investigation, together with testimony and statements of witnesses, can be used for any administrative purpose, e.g., basis for imposing pecuniary liability against military personnel; use in connection with claims against the Government. The following points must be clearly defined and understood by the convening authorities for accident investigations and collateral boards, by members of these boards, and by all witnesses.

*a.* Testimony or statements given to the accident investigation board by a witness or by personnel involved in an accident may not be used or compared — either in whole or in part — by the collateral investigation board. Testimony to the accident investigation board is given with the understanding that it cannot be used for other than accident prevention purposes and witnesses are advised that it will be treated in confidence. Therefore, it is neither legal nor ethical to allow testimony given under these conditions to be used or compared with testimony given for purposes of a collateral investigation.

*b.* In the case of witnesses testifying before a collateral investigation board, each witness must be advised fully of his constitutional rights or of the provision of Article 31, UCMJ, as appropriate.

*c.* Members of the aircraft accident investigation board will not be assigned to a board conducting a collateral investigation of the same accident.

*d.* No member of the collateral board may attend the aircraft accident board proceedings.

*e.* Witnesses may not appear before a collateral board until they have been released by the accident investigation board.

*f.* Under no circumstances can a witness be required to divulge the accident investigation findings or recommendations. These restrictions apply to any person who may have knowledge of the substance of a report of an accident investigation and who may be called as a witness before a board conducting a collateral investigation of the same accident. It is imperative that all witnesses appearing before, or submitting testimony to, the collateral investigation be informed of the nature of the investigation and the possible uses of such testimony. This is to ensure that they are fully aware of the differences between the two boards.

OUR CH-47 CREW called the area "land of the man-eating ferns." Located in the central highlands of South Vietnam, it is rugged, high, and beautiful. The foliage is so thick there would be little chance to walk out in case of an emergency landing. In addition, there were 7,000-foot mountain peaks, cascading waterfalls, and an occasional Montagnard village. Single ship recovery missions were grim in this foreboding land.

We were bound for a special forces camp to sling load a disabled UH-1D and return it to our base for repairs. The direct support unit on site was to have the ship all rigged and ready for us to hook.

Our Chinook was loaded with the necessary food, water, weapons, ammunition, extra rigging gear, and survival kits. We arrived at our first checkpoint on time and got a radio steer to the south to avoid artillery. There were thundershowers and the weather looked dark and grim to the west in the mountains.

My copilot was flying. I was looking at a map for the terrain features south and east of our destination for possible departure routes. The menacing weather was apparent to the crew. Flying at 100 knots, we were riding out the light turbulence from a ridgeline. We detoured around shower after shower, following one canyon, then skipping to the next.

We were 2 miles out when I saw the UH-1D we were to recover near a river. Two or three people were standing nearby. I called to ask about the damage to the helicopter. There was no reply. I knew from experience that badly damaged helicopters require special rigging.

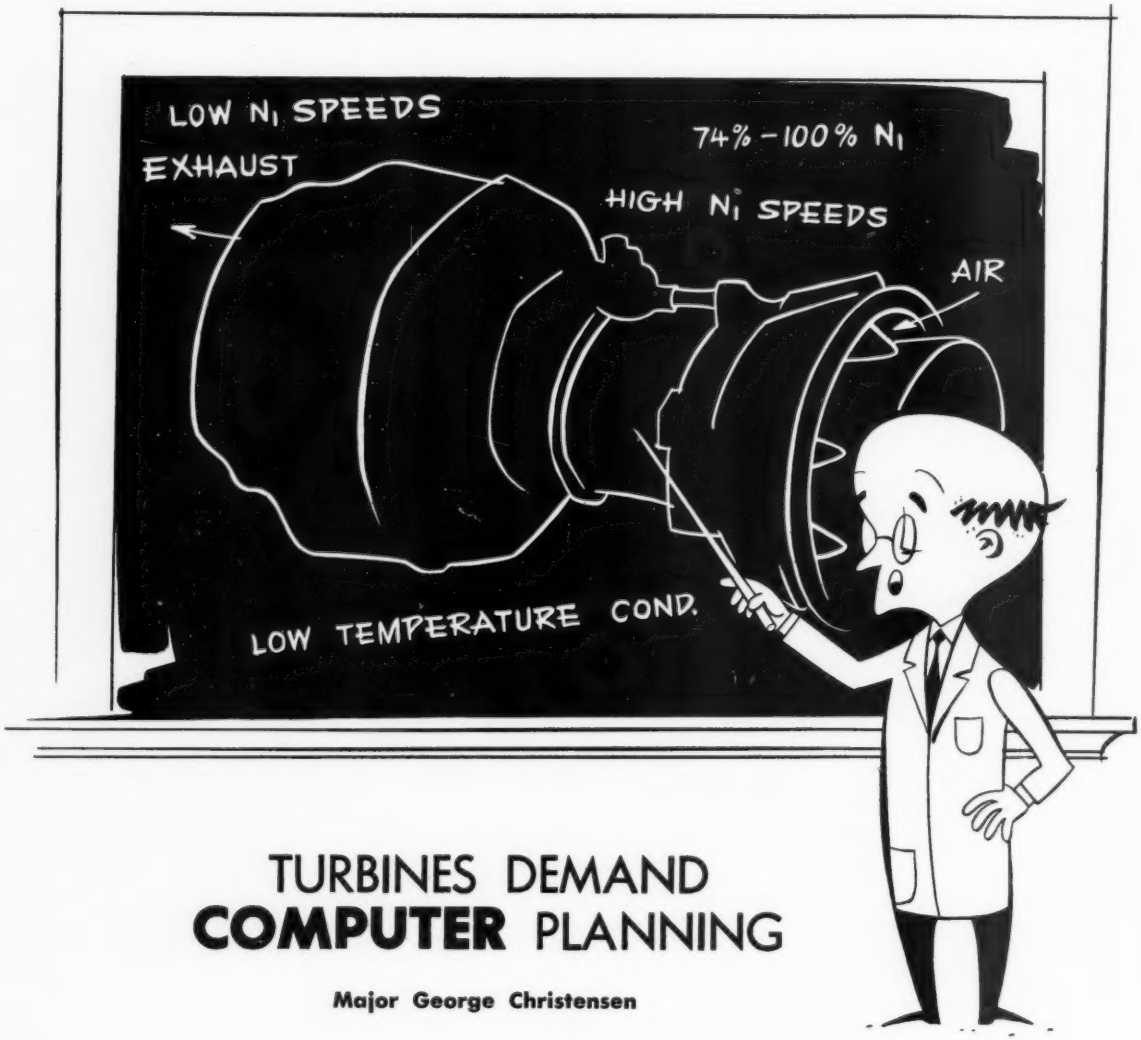
We arrived over the site and expedited the hookup. Dark, low clouds concealed the tops of the hills on three sides of us. We made a turn and started down the river.

When we reached the point where I should have turned west, there was a solid wall of rain. I poked into a lighter looking area and descended to the treetops. I threw down the map and turned on the wipers. It was useless trying to navigate. We needed all eyes and hands to stay contact. Soon, I made a 180° turn.

We were boxed in, surrounded by high terrain and showers in all quadrants. Our fuel was dwindling. Only a break in the weather and a straight flight to base would save us from a survival situation.

The last time I turned west, the visibility improved. I saw a place a half mile away where the river turned and flew straight on course 25 feet above the water. The visibility continued to improve after one or two more turns.

That night in the club, we asked about the condition of the helicopter we had sling loaded. A maintenance officer told us it had been test flown, but nothing could be found wrong. We had braved the perilous "land of the man-eating ferns" to recover a perfectly good and flyable helicopter.




# TURBINES DEMAND **COMPUTER** PLANNING

**Major George Christensen**

WOULDN'T YOU LIKE to know, prior to takeoff in your Huey, whether or not you will have an accident because of lost rotor rpm? Of course you would. But how can you make this determination with any degree of accuracy? Woudn't it be great to have a computer that would sense $N_1$, $N_2$, gross weight, inlet air temperature, wind speed and direction, barrier height, takeoff distance required/available, density altitude, pilot technique, mission urgency, system efficiency, and simply activate a red or green light in the cockpit to let you know? Would you believe that such a device has been developed?

It's not a thing of the future — it's here now! It costs the government in excess of $100,000 to produce and there are generally two in each aircraft. This device is called an Army aviator. The trouble is that some input channels appear to be blocked to this human computer. Too often, the cockpit readout is garbled instead of red or green and *"let's give it a try"* prevails.

Aviators imbued with a desire for mission accomplishment have made Army aviation a tremendous asset to the ground commander. Unfortunately, this sometimes ill-advised "let's give it a try" concept has cost us dearly in both men and material.

Let's discuss the inputs this computer needs and

then proceed to the cockpit readout. For this discussion, all data applies to the T53-L-11 engine. The principles apply to all turbine engine operations.

$N_1$ percent is the most important single factor in UH-1 operation. It is most important because it tells you exactly how much power you have demanded and how much power you have left. But how do you interpret this instrument and make it a useful tool?

Each instrument panel has a placard. The second line of this placard states "MAX $N_1$ RPM STD DAY_____%." Technically, the penciled-in figure is only applicable at standard day conditions. Actually it can be used with slight adjustments, under all conditions. As you depart standard day conditions to hotter temperatures, the maximum $N_1$ available will decrease slightly. Table 1 will help you visualize the reduction in maximum $N_1$ speed available.

This table shows that if you check your free air temperature and then read the standard day maximum $N_1$ as shown on the placard, you should subtract, for example, 1% at 30° C. For RVN operations, this is generally a good planning figure. (Some units have incorrectly entered the maximum $N_1$ available during the last topping check under existing conditions, instead of maximum $N_1$ from the *green run* on this particular engine. Placards should be checked for accuracy.)

The important thing to remember is that WHEN YOUR $N_1$ SPEED REACHES ITS MAXIMUM AND STOPS INCREASING WITH THE APPLICATION OF ADDITIONAL PITCH, YOU HAVE DEMANDED AND RECEIVED THE MAXIMUM POWER AVAILABLE. FURTHER APPLICATION OF PITCH WILL ONLY DECREASE POWER AVAILABLE BY REDUCING $N_2$ RPM.

All L-11 engines are set to develop 1100 shaft horsepower *on a standard day* (29.92" Hg and 59° F). This is accomplished on a test stand prior to issue and installation. If the engine is set at other than standard conditions, it will be adjusted to the manufacturer's specifications. See table 2.

This means that if your inlet air temperature is 95° F (35° C), you will never have more than 900 horsepower available, a loss of 200 horsepower. From table 1 you can determine that your $N_1$ will also decrease 1.4% at this temperature. If the temperature drops, or you fly to another area where it is only 59° F, you will automatically produce 1100 SHP with this engine and maximum $N_1$ speed will increase 1.4% to equal the placard data for a standard day. It is important to remember that the engine will lose 200 SHP and 1.4% $N_1$ speed as the daytime temperature warms up from 59° F to 95° F.

**TABLE 1**

| TEMP | MAX $N_1$ AVAILABLE |
|---|---|
| 15° C (std day) | as shown on placard |
| 20° C | -.3% |
| 25° C | -.6% |
| 30° C | -1% |
| 35° C | -1.4% |
| 40° C | -1.8% |

**TABLE 2**

| INLET AIR TEMP (nearly the same as free air) | SPECIFIED SHP OUTPUT |
|---|---|
| 70° F | 1039 |
| 80° F | 980 |
| 90° F | 927 |
| 95° F | 900 |
| 100° F | 879 |

## TURBINES DEMAND COMPUTER PLANNING

TABLE 3

| $N_1$ SPEED | $N_2$ SPEED | SHP DEVELOPED |
|---|---|---|
| 96% | 6600 | 876 |
| 96% | 6400 | 853 |
| 96% | 6200 | 852 |
| 96% | 6000 | 849 |
| 96% | 5800 | 843 |
| 96% | 5600 | 823 |

FIGURE 1

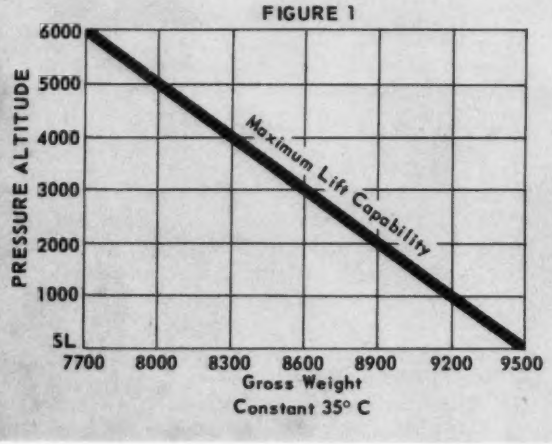
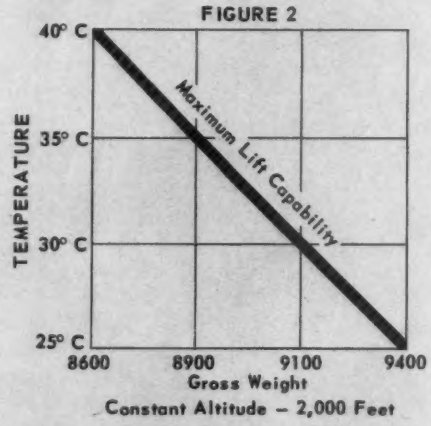



FIGURE 2




This is equal to nearly 600 pounds of lift capability.

Suppose now that you bring the aircraft to a 2-foot hover and do not demand power to the point that maximum corrected $N_1$ speed is used. What does this tell you? It tells you that you have a reserve. Let's equate this reserve to useful information in terms of aircraft performance, load capability, wind, and terrain.

In flight school you made hundreds of takeoffs at stagefields from paved lanes with no barriers. During each normal takeoff you hovered the aircraft and applied forward cyclic and up collective to initiate the maneuver. What you may not have realized is that each time you applied this up collective you demanded and received approximately 2% additional $N_1$ speed. Therefore, you should have at least 2% $N_1$ speed in reserve before starting a normal takeoff using that technique. You probably also discovered, through demonstrations and practice, that with a little headwind and patience, you could take off without pulling any additional pitch and, therefore, demanded no additional $N_1$. After the barriers were installed at the stagefield, you started making confined area takeoffs. These require about 3% additional $N_1$. Vertical takeoffs require about 4% more $N_1$ output than the power required for a 2-foot hover. These reserves and smooth control application will allow you to take off from various areas with no loss of rpm.

To apply this information to a real situation, it is necessary to hover the aircraft at a 2-foot skid height and read $N_1$ at a hover. Subtract hover power required from maximum $N_1$ available (corrected for temperature). This figure will give you your reserve

and determine what type takeoff you can accomplish.

Now look out the window. What type takeoff is required? If you must depart a confined area and have only 2% $N_1$ left, you probably will pull off considerable $N_2$ rpm during the takeoff. If you have less than 2%, you won't make it! If you have 3% you will make it with no loss of rpm. If you have no reserve left, the best you can do is sneak it out slowly if you have a 5-8 knot headwind and no barriers. This type takeoff obviously can't be made from a confined area.

Suppose you are at a stabilized 2-foot hover with no reserve $N_1$ and find yourself in a confined area. You need 3% more $N_1$ speed to clear the barriers. How can you get it? Reduce the load. One-fourth of 1% $N_1$ is enough power to lift 100 pounds. If you need 3% you must reduce the load by 1,200 pounds to take off with no loss of rpm. There is no other way! Generally, overload conditions will not be this extreme. A 400-600 pound reduction in load will provide the additional 1%-1½% $N_1$ needed to provide the required 3% reserve.

It takes more power to hover over tall grass than a hard smooth surface. How much? About ½% to ¾% $N_1$ to maintain the same 2-foot hover altitude. If the takeoff is from a hard surface area, dropoff is in an unimproved LZ, and less than 300 pounds (¾% $N_1$) of fuel will be burned off en route, you need to assure that the additional power required for landing is available prior to takeoff. If a 4-foot hover in the LZ is required instead of a 2-foot hover, an additional one percent will be required. Plan ahead! Forecast your $N_1$ needs during landing. If hovering out of ground effect is required to complete the mission, 3½% more than the $N_1$ required for a 2-foot hover over a hard flat surface will be required.

All this may sound very complicated. A few rules of thumb may help to clarify it:

- Two percent reserve $N_1$ is required for a normal takeoff. If terrain, wind conditions, and pilot technique are favorable, a takeoff can be made, but is not recommended, with no $N_1$ reserve.
- Three percent reserve is required for a confined area takeoff.
- Four percent reserve is required for a vertical takeoff. Don't cheat on this one.
- Tall grass *or* a 4-foot hover requires ¾% additional power. Tall grass *and* a 4-foot hover require 1½% additional power (compared to a 2-foot hover over a hard surface).
- Out-of-ground-effect hover requires 3½% additional $N_1$ speed, compared to a 2-foot hover.
- A 3-knot tailwind will require 1% additional $N_1$ at a 2-foot hover.

$N_2$ is the next computer input. Sixty-six hundred is the operating rpm. It is also the maximum output shaft rpm (red line). Shaft horsepower output is a function of $N_2$ rpm. Any reduction in $N_2$ rpm causes a reduction in horsepower available to turn the rotor and fly the aircraft.

A typical T53-L-11 engine was placed on a test stand. $N_1$ was set at maximum speed. $N_2$ was loaded until the rpm was pulled down. The results are shown in table 3.

Table 3 illustrates there is a loss of SHP available as $N_2$ rpm is slowed down. Converting this loss of SHP to lift capability will show its effect on aircraft performance. One percent $N_1$ in the higher operating ranges is equal to 45 shaft horsepower. A loss of 53 SHP, as shown in table 3, can be equated to a loss of slightly more than 1% $N_1$. One percent $N_1$,

## TURBINES DEMAND COMPUTER PLANNING

as we learned earlier, will lift 400 pounds. Therefore, when you pull your $N_2$ rpm down from 6600 rpm to 5600 rpm, you lose approximately 500 pounds of lift capability. In effect, you increase your overload by 500 more pounds. The moral is don't pull off rpm if you need maximum performance. Go a little slower, establish a stabilized condition, and accept a lesser rate of climb or acceleration. Don't get on the back side of this curve!

You also need gross weight input. This is one of the hardest things to accurately determine in the field. First, you don't know what the aircraft weighs because it hasn't been weighed for some time. How much does the load weigh? Fifteen cases of "C" rations may be marked, but how about five murmite cans, three U.S. troops, a Red Cross girl, and one sack of mail? An estimate is the best you can possibly hope for.

A good ballpark figure for estimating how much load you can carry during hot weather is a total of 2,600 pounds of fuel and payload with an L-9A or -11 engine. This generally will allow you to make a normal takeoff at 25° C up to 4,000 feet DA. The real crux of the matter is: What are your $N_1$ and $N_2$ doing with this load under existing conditions? In cold climates, maximum gross weight computations must be made so that this limit will not be exceeded. In hot weather, it is difficult to exceed the 9,500-pound limit. Figures 1 and 2 are useful for determining lifting capability under conditions of varying altitude and temperature. Figure 1 shows that gross weight must be reduced by 300 pounds per 1,000 feet increase in altitude to maintain the same performance. Figure 2 shows that gross weight must be reduced 300 pounds for each 5° C increase in temperature to maintain the same performance.

If your mission involves changes in altitude or temperature during a single flight or a day's operations, your loads must be adjusted to meet the conditions. If you use all you have to get off at sea level with your load, don't attempt a hover at 3,000 feet with the same load. You will be 900 pounds over your *allowable* gross weight, 2¼% short of $N_1$ required to hover, and the result will be lost rpm, lost tail rotor control, and one bent aircraft. If you must go, approach to the ground. The aircraft just won't hover. If you can't do that because of the condition of the LZ, go to the nearest suitable area, drop off 900 pounds, and shuttle your load in.

Inlet air temperature is extremely critical in turbine engine operation. Table 2 illustrated the effect in loss of horsepower. You have no instrument to tell you what your inlet air temperature is, but it can be estimated, as a relative factor, from available data.

How many times has tail-end Charlie in the formation got caught in the turbulence of the other aircraft, lost rpm, and crashed into trees? Turbulence played a role in these accidents, but inlet air temperature was also critical. The last aircraft ingests the heated exhaust of the lead aircraft. If the air temperature where he was operating was raised 5° F, he would lose as much as 25 horsepower. That's enough power to lift more than 200 pounds. This is equal to one man less than the lead ship could carry in a critical situation.

As a single ship, if you hover for more than one minute before attempting a takeoff, you will set up a flow of your own exhaust gas and raise your own inlet temperature as much as 10° F. You will lose as much as 50 horsepower prior to moving out. That is equal to a loss of 500 pounds lifting capability. If your tail is into the wind, this factor will be amplified due to increased ingestion of the hot gases.

What can you do about inlet air temperature? Be aware of the effect and plan for it. Avoid prolonged hovering prior to takeoff. If you are tail-end Charlie and the mission will permit, wait a few seconds before you take off to allow the gases to dissipate (avoid the turbulence, too). Don't hover with your tail into the wind. If you're a mission planner, reduce the load in the rear aircraft.

The computer needs barrier height, takeoff distance, and wind input information. Look out the window and see the barriers. Know what performance is required of the aircraft to perform the maneuver. Check your $N_1$ reserve and consider the wind. A 2-KNOT TAILWIND WILL INCREASE YOUR TAKEOFF DISTANCE TO CLEAR A 50-FOOT OBSTACLE BY A FACTOR OF THREE.

How do you determine a wind of only 2 knots when you are down in an LZ or PZ? One way is to lift the aircraft to a hover and check the rotorwash pattern in the grass. The direction that the rotorwash travels the least distance is into the wind. Take off in that direction. If you have a flight of aircraft, use a smoke grenade or the gunships to give you accurate wind information. Then take off into the wind. At semipermanent installations, put up a sock or streamer of some type.

Density altitude will give you a ballpark estimate of aircraft performance. It is useful in initial planning of each operation, but checking your $N_1$ at a hover will provide a direct readout of the effect on your aircraft. Use density altitude as an input, but

don't establish your *rules for operation* solely on this factor. Takeoff conditions vary so much that you need actual, not predicted performance data. Density altitude affects rotor system efficiency. The factors that control density altitude (mainly temperature) have a direct effect on engine performance, as previously discussed.

Pilot technique is an important input to the computer. Each takeoff and landing must be planned. I once heard an Army aviator describe the best pilot he ever knew. "This guy is so good that he does nothing that was taught in the school!" he said. "He has developed all his own techniques and procedures." I don't know which cemetary contains this great pilot. Unless you want to join him, I recommend using the tried and true school solutions. That's not to say school procedures cannot be modified, but if modified, you should have a good reason. In any event, there is no substitute for smoothness on the controls, prior planning, and coordination, especially in turbine engine helicopter operations.

There will come a time when urgency of the mission will preclude meeting published safety requirements. Many aircraft and lives have been lost, though, during attempts to accomplish the impossible. You, as an Army aviator, must know how to recognize the impossible. The above data should help you. If you lose rpm at a hover, it is pretty silly to attempt a confined area takeoff. If a downwind departure will increase your takeoff distance threefold and the barriers are a factor, don't try it. If it's a lead pipe cinch and there isn't enough room, take off in the other direction. Charlie will probably miss if he is there and influencing your decision. I'd rather take my chances with him and be a hero than to take on an impossible flight situation and be a dunce. If you don't think he will miss, and you do make a downwind departure, make two trips with a lighter load. What may look like a normal takeoff situation becomes a confined area operation when attempted downwind. Remember the increased $N_1$ reserve required for a confined area takeoff. If you don't have 3%, don't try it. Remember also the loss of available SHP due to the rise in inlet air temperature with your tail into the wind.

**Of all the inputs this computer needs, N1 percent is the most important single factor in UH-1 operation . . .**

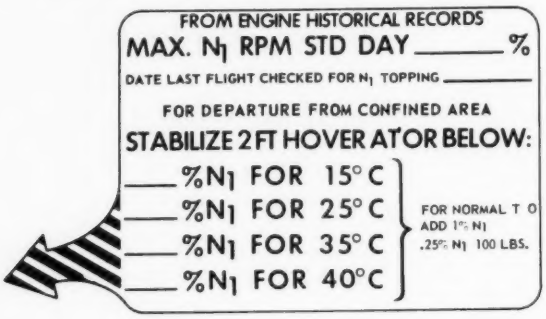
The last computer input we will discuss is system efficiency. This is another way of saying *know this aircraft*. Each aircraft is different and you must know how the one you are flying performs. Get the feel of it before you get into a critical situation. Know how the engine accelerates. Know what performance this set of rotor blades will give you. Know how much $N_1$ speed is available, before you need it all to get in or out of an area, and know what your crew can do to help.

Those are the computer inputs. Now for the readout. This is where the government's investment pays off. This is where you, the Army aviator, weigh the factors and make the decision. Let's provide some inputs and solve a mission problem.

You are the AC in a UH-1D (L-11 engine). Your maximum placard $N_1$ speed for standard day conditions is 96.2%. The temperature is 30° C. You can expect 95.2% to be the maximum $N_1$ speed available at takeoff. The departure field elevation is 1,000 feet. You are number three ship in a six-ship formation and your ACL is six troops. You fuel load is 1,000 pounds at takeoff and it is a 30-minute flight to the LZ. The elevation of the LZ is 3,000 feet. You will depart an open hard surfaced area and drop off in a confined area, three ships at a time. The surface of the LZ is grassy and the wind is light, 3 knots from the south. There are barriers to the south and west at the LZ. You are flying an aircraft you are familiar with and it is a good ship. Let's see if you will make it.

A quick calculation of gross weight indicates that

with 1,000 pounds of fuel and 6 X 250 pounds for troops gives you 2,500 pounds payload. With an


FROM ENGINE HISTORICAL RECORDS
MAX. N1 RPM STD DAY _____ %
DATE LAST FLIGHT CHECKED FOR N1 TOPPING _____
FOR DEPARTURE FROM CONFINED AREA
STABILIZE 2 FT HOVER AT OR BELOW:
___%N1 FOR 15° C
___%N1 FOR 25° C
___%N1 FOR 35° C
___%N1 FOR 40° C
FOR NORMAL T O
ADD 1% N1
.25% N1 100 LBS.

approximate weight of 6,400 pounds for aircraft and crew, your takeoff weight is right at 8,900 pounds. You are 100 pounds under the 2,600 pounds planning figure for fuel and cargo loading. No problems yet.

The troops are loaded and you come to a 2-foot hover. (It is important to use an exact 2-foot hover or your basis for further calculation will be off. If you use less than 2 feet, your $N_1$ reading will be low and conversely, a 4-foot hover will require 1% additional $N_1$.) Your $N_1$ reads 94.2%. No sweat, you still have 1% $N_1$ in reserve. You have less power reserve than required for a normal takeoff but can still make a safe departure with smooth application of controls.

The takeoff is started and you tuck it in tight so the formation will look good. Inlet air goes up 5° F because of ingested exhaust from the lead ship and the reserve is cut to one-half of 1%. A little turbulence, a little pitch, and $N_2$ rpm is down to 6400. You get into translation though, and the aircraft is flying. Sound familiar?

The flight to the LZ is 30 minutes and 300 pounds of fuel are burned off. The approach is started and, as you get near the ground, you pick your spot.

In planning this dropoff, many things must be considered. You are 2,000 feet higher than takeoff field elevation. That creates a loss of 600 pounds lifting capability. Temperature is still 30° C. Three hundred pounds of fuel have been burned off. Your aircraft is 300 pounds *heavier*. The LZ is covered with grass. That will require another ¾% $N_1$ to hover at 2 feet, making you another 300 pounds *heavier*, a total of 600 pounds. That is equal to an additional 1.5% $N_1$ requirement to maintain a 2-foot hover in this LZ. You only had 1% reserve on takeoff, so you are behind the eight ball by ½% $N_1$.

As you near the ground, you see the area you selected is dotted with stumps. This will necessitate a 4-foot hover, requiring another ¾% $N_1$. At termination, $N_2$ rpm drops off. You frantically try to get the troops out. The light comes on and the audio is screaming in your ear. At 5600, tail rotor control is lost and so is the aircraft. You didn't make it. You were 1.25% short of $N_1$ to maintain a 4-foot hover over tall grass at 3,000 feet. You were 500 pounds overloaded for conditions.

Could you have predicted this crash? Yes, you could have. Even without the stumps you would have been 200 pounds over your predictable maximum allowable gross weight in the LZ. You may have gotten the troops out at 6000 $N_2$ rpm and saved the ship, but that's *maybe*.

Your forecast power requirement for this dropoff could have been easily computed in this manner:

| FACTOR | CAPABILITY | $N_1$ REQUIRED |
|---|---|---|
| 2,000 feet increase in elevation | —600 lbs. | +1.5 |
| Hover over tall grass | —300 lbs. | +0.75 |
| Hover 4 feet high | —300 lbs. | +0.75 |
| Total loss capability (increased $N_1$ required) | 1200 lbs. | +3.0 |
| Fuel burned off | 300 lbs. | —0.75 |
| Condition in LZ | —900 lbs. | +2.25% |

Therefore, you needed 2.25% $N_1$ reserve, or a reading of not more than 93% $N_1$ in this aircraft at a 2-foot skid height hover prior to takeoff if the mission was to be safely flown and the dropoff made with no reserve power. Good pilot technique could have pulled you through under these conditions if the troops could have been offloaded before your inlet air temperature began to rise due to recirculation of exhaust.

The ACL for your aircraft should have been four troops. A 500-pound reduction was required. (Hover prior to takeoff — $N_1$ was 94.2. Maximum available was 95.2. That put you 1.2% above the required $N_1$ for this mission. This is equated to 500 pounds of lift capability.)

This all may sound terribly complicated at this time, but really it isn't. Try it a few times and see it work. Follow these simple steps.

- Secure load and estimate gross weight (not to exceed 2,600 pounds of fuel and cargo during hot weather).
- Hover the aircraft and check $N_1$ required. Subtract this from maximum available under the present conditions. Determine what type takeoff is possible.
- Look out the window, and see what type takeoff is required. Apply $N_1$ reserve against $N_1$ needed to make the required takeoff. Adjust load as necessary.

• Determine wind direction. Consider effects of inlet air temperature if prolonged hovering is required.

• Forecast landing power required, considering the condition of the LZ surface, temperature, altitude, wind speed and direction, number of aircraft (inlet air temperature), pilot technique, system efficiency, barriers, and mission urgency. *DON'T ATTEMPT THE IMPOSSIBLE. ADJUST YOUR LOAD.*

• Pull pitch slowly and have a good flight.

None of this is new. All the data provided comes from rules of thumb and standards of performance set forth by the manufacturer and published by him or the Army. What is new is the thought process you the aviator go through to make the Go No-Go decision. The hover check, whether using Go No-Go placard data or the 4, 10, 25-foot method, is excellent, if abided by, for that takeoff. But what about the landing? The method outlined above tells you how to plan for the landing situation. Landing is as equally demanding as the takeoff.

You say you don't have time to make these calculations prior to each takeoff? Maintenance doesn't have time to recover and repair your bent helicopter either, and there isn't enough time to manufacture replacements. Most planning can be done prior to entering the cockpit. Much of the data is available. Flight leaders can specify $N_1$ reserve each aircraft must have at takeoff, applying data learned from the reconnaissance. In the sample situation, the flight leader could have known the night before that 2.25% $N_1$ reserve at takeoff would be required to make the lift. He would have known the 3,000-foot LZ was grass-covered and that three ships would be in there at a time. He should have suspected stumps. He had seen the barriers and knew the duration of the flight. A 30-minute flight in this case would provide ample time to join up and not require a formation takeoff. Prior to the operation, he need only have checked the wind. Temperature doesn't change the $N_1$ reserve requirement, if it is the same at the PZ as it is at the LZ. Temperature could be accurately forecast, knowing the time of day the operation was to take place.

Try this procedure. It will work. It may save your reputation, your aircraft, your flight, your unit, and your life.

# TEST FLIGHT NEEDED

OH-23G PILOT: "I was cleared and started my approach at approximately 2,000 feet, reducing manifold pressure to about 13-14 inches. I saw the needles had split, with the rotor needle approaching the red line and the engine needle in the green. I pulled up on the collective to bleed off rotor rpm. As I did, I heard a surge in the engine and saw the engine needle between 3500-3600 rpm. I closed the throttle and the engine rpm dropped to 3000-3200, but the rotor rpm had fallen off to around 300.

"I tried to crack the throttle again, without pulling any more collective, hoping to rejoin the needles. But the engine surged again, indicating 3400-3500 rpm. My rate of descent and angle of approach were still going pretty well, so I decided not to go into a power-off autorotation because I thought I would most likely land in the buildings if I shot straight ahead and there didn't seem to be any place either side where I thought I could put it without crashing into parked aircraft.

"I didn't want to take the chance of having an overrevved engine freeze up or fail on me if I tried to make a power recovery at the bottom. It was apparent I still had engine power and my rate of descent looked good.

"I felt no unusual vibrations and there was nothing to indicate the aircraft was approaching an unusual attitude. It seemed to me the best course of action was to hold what I had and try to shoot for the pad, as originally planned . . .

"I called the tower to tell them I was having engine trouble and anticipated a hard landing. I can't remember whether they acknowledged me or not. By this time, I had approached the buildings with about 40 knots airspeed, so I was intent on reducing that prior to touching down on the first pad. I was about 10 feet in the air with just about all of my airspeed killed off when I decided to pull in all the available power left to try and cushion my landing . . . .

"As I pulled in the remainder of my collective, the engine surged once more and I impacted very hard. I attempted to keep the skids fairly level, but the aircraft bounced in the air and settled a second time in a nose high attitude. I heard a crunching of metal and it skidded several feet. I tried to put my collective down, but it was stuck. I shut off the master switch and the magnetoes . . . ."

*Investigating officer:* "A test flight was necessary to clear the aircraft from maintenance on the incidence arms which had been done the day before. The pilot was not on test flight orders, and could not perform the required test flight . . . He started his approach much too steep and wasn't really sure whether or not he had power to the rotor system throughout the approach . . . ."

*Technical inspector's report:* "The throttle lever for the left carburetor was installed on the shaft at 29°. It should have been installed at 37° 30′.

"The throttle lever for the right carburetor was installed on the shaft at 90°. It should have been installed at 60° 30′.

"With the throttle in the closed position, the left carburetor shaft arm had a .058 gap between the arm and stop screw. There should be no gap as this screw sets the engine idle rpm.

"With the throttle in the closed position, the right carburetor throttle lever had '0' gap. There should be a .030 gap or the stop screw should be backed out one full turn, as this is a secondary stop and should not touch.

"With the throttle open to the approximately 3200 rpm position and the collective stick raised to the approximately hover position, the throttle could not be opened any further, but started to roll to the closed position. This indicated the throttle correlation was out of rig.

"Rod end bearings used on the dual carburetor interconnecting rod were worn excessively (approximately .020 inch).

"The screw securing the throttle lever to the shaft was not safetied.

"The jam nut on the forward end of the throttle control cable was found loose.

"The jam nut on the aft end of the throttle control cable was found loose.

"The nut and bolt connecting the carburetor cable clevis to the carburetor throttle arm was installed backwards.

"With the collective full down, there was .090 inch gap between the collective pitch ballast bracket and washer stack. This should have been '0' as this is the collective pitch down stop.

"With the collective in full up position, the flyweight tubes could be raised up and would override the collective pitch ballast links, with both flyweight tubes locked in the up position.

"Collective pitch ballast bracket bushing was worn beyond tolerance.

"The washer stack was frozen on the upper collective pitch rod."

# Lateral CG

OH-13E TEST PILOT: "I flew for 45 minutes, checking the aircraft for a rough engine and light damping action. Returning, I noticed vibrations in the helicopter and cyclic control system. I parked in front of maintenance and my mechanic got out to watch for vibrations as I ran up the engine . . . I ran the engine up to 3200 rpm and got the aircraft light on the skids. It started turning toward a jeep on my left. I couldn't stop the turn, so I pulled pitch and raised the helicopter to avoid hitting the jeep. Cyclic and pedal controls were ineffective.

"The helicopter passed over the jeep and then settled to the ground tail low. I felt I was spinning fast after I hit the ground. . . ."

*Mechanic:* "We were going to check the sprag mounts on the engine deck. The pilot hovered and I observed while walking around it. I asked him if it would be all right if I stood on the skid while he hovered. He nodded yes. I got on the left skid and I was close enough for him to touch me. He got it light on the skids and the next thing I knew, I saw the top of a jeep below me. We spun to the left 360° and the tail boom or tail section hit first. . . ."

*Witness:* "I was working approximately 150 feet from where the accident occurred. I heard an unusual noise, looked, and saw the helicopter turning to the left in a tail low attitude. The rear of the skids hit the ground. The main rotor blades were turning and the aircraft was spinning. I saw one of the main rotor blades pass over the head of the mechanic on the left side of the aircraft. He started to run and a main rotor blade just missed him, perhaps a foot or so. . . ."

*Narrative:* "Lateral cg was computed with an arm of 40 inches and the mechanic's weight of 213 pounds. It was determined that his weight placed 8,520 inch pounds on the left skid. In the opinion of the board, this weight, added to the pilot's weight on the left side of the aircraft, probably made it uncontrollable at liftoff."

Among the cause factors listed by the board was a lack of knowledge by both the pilot and mechanic concerning weight and balance limitations.

*. . . accept the emergency and maintain your initiative in the form of positive aircraft control . . ."— Emergency Landing and Ditching Techniques in Helicopters, by Gerard Bruggink*

# Well Done

WO1 WILLIAM A. BRITT, a 22-year-old UH-1C aircraft commander, was flying a mission in support of a lift flight. He landed at a fire support base to refuel and rearm, then took off into darkness at 1925 and climbed on a northerly heading across a river. Approximately 5 minutes later, at about 700 feet, he heard a loud boom and the engine failed.

WO1 Britt autorotated and made a 180° turn back toward the river where he knew there were rice paddies to land on. Neither Britt nor his pilot could see the ground. At about 300 feet, he put on the landing light, but was still unable to see the ground because of haze. At 150 feet, Britt saw that there were only trees beneath him and began a flare to zero out his airspeed for a tree landing. At about 75-100 feet. he saw an opening through the trees to his left, turned left, continuing his flare, and pulled the remaining pitch at approximately 10 feet. The helicopter landed hard, spreading the skids, bounced forward 6 feet, and rocked on the chin bubble. The tail boom was severed at the 42° gearbox by the main rotor blade.

Company commander: ". . . The aircraft commander's action in turning toward the open area while in a flare at approximately 100 feet most likely saved the aircraft from total destruction . . ."

WO1 Britt's skill and good judgment under adverse conditions undoubtedly saved his crew from injuries and his aircraft from more severe damage.

*From Army Aviation Safety Course*
*University of Southern California*

# THE LONG ROAD HOME

IT WAS MY FIRST assignment out of flight school. I was given an O-1 and told to fly a doctor to a field hospital to pick up medical supplies. We had lunch at the hospital and took off for home at 1500. It was bitterly cold. As we passed a big city, I heard the following transmission from a pilot about 25 miles to the west of my course: "Ceiling and visibility dropping rapidly due to heavy snow."

It startled me because I had just taken off 10 minutes before with a forecast for a 5,000-foot ceiling, 5 miles visibility, and no precipitation.

"Hey, Doc, did you hear what I just heard?"

"No, I still haven't learned to understand all that garbled noise."

I repeated the transmission and wondered what I should do. Should I land and recheck the weather or continue on? I looked to the north along my intended route. It looked grey, just as forecast. If the heavy snow did move in from the west, I felt I could always turn east where I could land at one of several airfields. If I continued on without stopping, I could probably beat the storm, since I was only 35 minutes from home.

There was a long valley that led to our destination. I knew the terrain well. The dirt road that ran along the valley floor would lead me right to the airfield. "Doc, I think we can beat this storm home. I am going to fly up that valley off our 12 o'clock position. It leads directly to our field."

I turned into the valley feeling pleased with myself. I remembered what I was told during the local orientation I had when I arrived. One of the more experienced pilots said that the weather was change-

able and it was a good idea to make low recons of frequently flown areas to develop low level routes to use in bad weather.

I knew every terrain feature of the valley and every curve of the road. I was confident I could navigate in the valley with the lowest visibility. Until then I had never had a chance to put this to a test. I found myself almost hoping that the weather would get a little low, so that I could show the Doc my low level navigation skill.

I didn't hear any radio transmissions from the time I turned into the valley. We were about 5 miles up the valley. I was flying at 1,000 feet, just below the tops of the mountains that formed the valley. Without realizing it, I had lost 1,500 feet.

All at once, snow began to fall. I pushed the nose down and reduced the throttle, trying to keep visual contact with the ground. We were then at 500 feet and the visibility was about 2 miles. This was the kind of weather that would let me demonstrate how well I could navigate in reduced visibility. I decided I wouldn't say anything to the Doc, but let my superb performance speak for itself.

I looked at my watch and saw that we were only 20 minutes from destination. The weather continued to worsen. Soon, I was sitting forward, straining to keep the dirt road in sight. With 15 minutes remaining, I was flying at 100 feet. The visibility was so poor that the road was the only thing I could see. Looking straight down in front of the aircraft, I could barely keep it in sight. It was like driving at night in a heavy fog when all you can see is the white line on the road.

I began to lose confidence. I realized too late that I had put myself in a situation where I was no longer in control. I had no alternate course of action. I had not beaten the storm home as I thought I would. I could not fly east to escape the storm because I could not get over the mountains. A 180° turn would serve no purpose. I could only follow the road.

Our home field was a 1,200-foot dirt strip running north and south. The road approached the strip from the south and ran parallel to it along the east side. I planned to follow the road until I had the strip in sight, cut the power, and make a straight-in landing to the north.

We were only minutes from the strip and it seemed that each turn in the road was the turn where it should be. Finally, there it was! But by the time I saw it on my left, it was too late for an approach.

A village clustered both sides of the road a half mile north of the strip. Since it was too late to make a straight-in landing, I planned a circling approach, landing to the south. I made a right turn to the east to give myself enough room for a left base to final.

Once I turned away from the road, I navigated by the huts in the village, making turns over known points. I rolled out onto what I thought should be final, less than one-half mile from where the end of the strip should be, but it was not in sight. I was flying just above the rooftops. I was certain that I was on short final. The runway suddenly popped into sight and I cut the power, dropped flaps, and landed, breathing a prayer of thanks to whoever looks after green and overconfident pilots.

# Pearl's personal equip

FROM A FLIGHT SURGEON'S statement from a recent UH-1B strike accident: "In reviewing the relevant information, we find that several factors stand out. The seat belt/shoulder harness systems held all three crewmembers in their seats, even though the seats separated from the aircraft, and the pilot and copilot stations were destroyed. The aircraft commander received a blow sufficient to crack the right side of his helmet visor cover, without suffering any injury from the blow. The aircraft commander stated that he wears his helmet chin strap 'tight,' while the other two crewmembers wore theirs 'loose . . .' Both of the latter lost their helmets."

The two crewmembers who were not wearing their chin straps tight and lost their helmets during the crash sustained concussions and other head injuries. Because of their injuries, they were unable to help themselves and had to be pulled from the wreckage by the aircraft commander.

Dear Pearl:

During the post-air assault days at Benning, a really outstanding chin strap for the APH series of helmets was designed around the old airborne style chin strap. I used one of them for several years and finally lost it in Vietnam.

The chin strap was simple, secure, and easily the most comfortable I've ever worn. Dr. Roy Kent, the flight surgeon who designed it, built up several for test by numerous aviators, and submitted some to Natick and to the Test Board at Fort Rucker.

What I'm really after; what happened to the de-

*if you have a question about personal equipment or rescue and survival gear, write Pearl, U.S. Army Board for Aviation Accident Research, Ft Rucker, Ala. 36360*

# ment and rescue/survival lowdown

sign, and where can I get some more of those good chin straps?

MAJ Jack E. Williams
Commanding
Air Cavalry Troop, 14th Armd Cav
APO NY 09146

Dear MAJ Williams:

I'm afraid you are out of luck on the "Kent" strap. Although limited quantities of this type strap were fabricated and some testing was done, it was never adopted for standard use.

Don't give up hope, however. It is recognized that an improved retention device is needed for the helmets. Work is progressing as rapidly as possible toward providing a chin-nape strap combination that will provide improved retention and comfort.

PEARL

Dear Pearl:

I read your articles in the AVIATION DIGEST and I think they're very interesting and bring out many important facts. I am stationed at Fort Bliss in a small aviation section. We have a problem trying to obtain crash rescue posters for our different types of aircraft. I would like some information on how I can obtain them.

SSG Roosevelt M. McPherson
Center Aviation Maint Section
Fort Bliss, Texas

Dear Sergeant McPherson:

Thank you for your letter and comments. Inclosed are crash rescue posters that have been published. Identical information may be found in the back of TM 5-315, *Fire Fighting (Structures and Aircraft) and Rescue Operations.* DA aviation safety posters may be obtained by submitting DA Form 12-4 in accordance with instructions on the back of the form.

PEARL

Dear Pearl:

Recently I read about your new type flight suits, Army Aviation, September 1967, and would appreciate more information about this item.

1. Federal stock number.
2. General description or photo.
3. Will it retain its fireproofing if washed by the wife at home?
4. Weight of material.
5. Cost.
6. Fire retardant effectiveness.

Being an Air Force chopper pilot, I have for several years found the standard one-piece flight suit lacking. There is no end to the zipper damage mama can do in the washing. Around both helicopters and cargo aircraft, sharp corners, flanges, and other items just seem to have a more ripping effect on flight suits than fatigues.

CPT Donald E. Van Meter
Detachment Provisional Second
APO SF 96213

NOTE: Our reply to CPT Van Meter was returned, marked "address insufficient."

Dear CPT Van Meter:

The Army NOMEX flight uniform presently provided Army flight crews in SEA is a 4.4 oz/yd$^2$ single

layer two-piece garment, comparable in color and general appearance to the standard fatigue uniform (see photo). The jacket has a covered zipper front; the breast pockets button; the sleeve pocket is zippered; and the cuffs of the sleeves are adjustable with self-adhering material. The trousers have covered slash pockets and hip pockets which button, thigh pockets with covered zippers toward the inside of the leg, and lower outside leg (calf) pockets with covered zippers along the top side. The trouser cuffs are adjustable with self-adhering material.

An extract from *Aviation Mechanics Bulletin*, dated September-October 1967, provides a good description of the qualities, properties, and safety features of NOMEX, as well as comparative protection ratings or fire retardant effectiveness of various clothing.

Listed below are the nomenclatures, FSNs, sizes, and purchase costs of the initial buy for the Army. These costs are expected to be reduced in the future.

Trousers, Flying, NOMEX, Aircrewman
$34.63 pr

| | |
|---|---|
| 8415-935-4881 | Small, short |
| 8415-935-4882 | Small, regular |
| 8415-935-4883 | Small, long |
| 8415-935-4884 | Medium, short |
| 8415-935-4885 | Medium, regular |
| 8415-935-4886 | Medium, long |
| 8415-935-4887 | Large, short |
| 8415-935-4888 | Large, regular |
| 8415-935-4889 | Large, long |

Shirt, Flying, NOMEX, Aircrewman
$23.42 ea

| | |
|---|---|
| 8405-935-4894 | Small, short |
| 8405-935-4895 | Small, regular |
| 8405-935-4896 | Small, long |
| 8405-935-4897 | Medium, short |
| 8405-935-4898 | Medium, regular |
| 8405-935-4899 | Medium, long |
| 8405-935-4900 | Large, short |
| 8405-935-4901 | Large, regular |
| 8405-935-6200 | Large, long |

PEARL

From: *Aviation Mechanics Bulletin*

NOMEX

"NOMEX" is a new member of a growing family of scientifically engineered fibers. Fabrics of

"NOMEX" are inherently flame retardant regardless of the number of washings. Clothing of "NOMEX" are machine washable, have high strength, superior abrasion resistance, and good chemical resistance.

After years of testing in industrial plants and by the Armed Forces, protective clothing of 100% "NOMEX" was found to outwear flame retardant cotton 5 to 1 under ordinary conditions and over 15 to 1 in areas where common acids were present. Repeated washings have no effect on "NOMEX" from the standpoint of its flame retardant properties. Clothing made of 100% "NOMEX" have excellent dimensional stability after 1,000 hours' exposure in air at 500° F. "NOMEX" still retains over 65% of its original strength and flex properties.

*Properties and Safety Features of "NOMEX"*

1. Inherently flame retardant — will not support combustion.
2. Does not melt or drip.
3. Good chemical resistance.
4. Abrasion resistance similar to 66 nylon.
5. Low fiber shrinkage.
6. Low thermal conductance.
7. No dermatological problems.
8. Comfortable to wear.

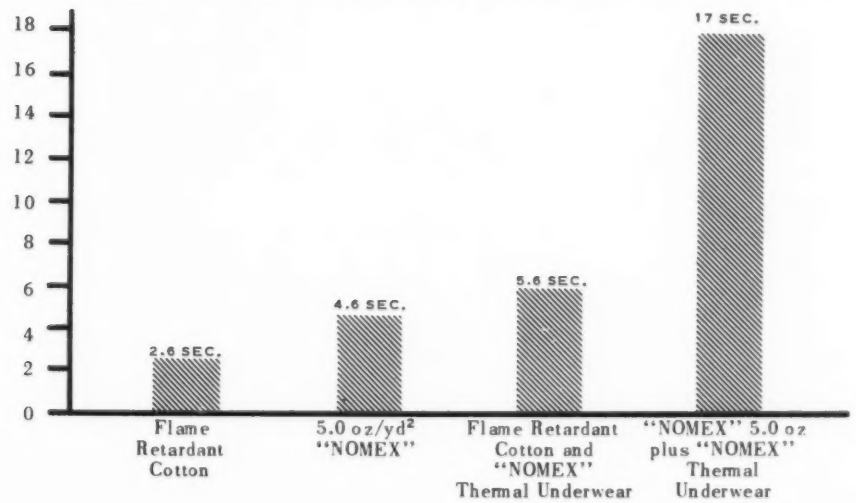
## EFFECTIVENESS OF WATER PURIFICATION TABLETS

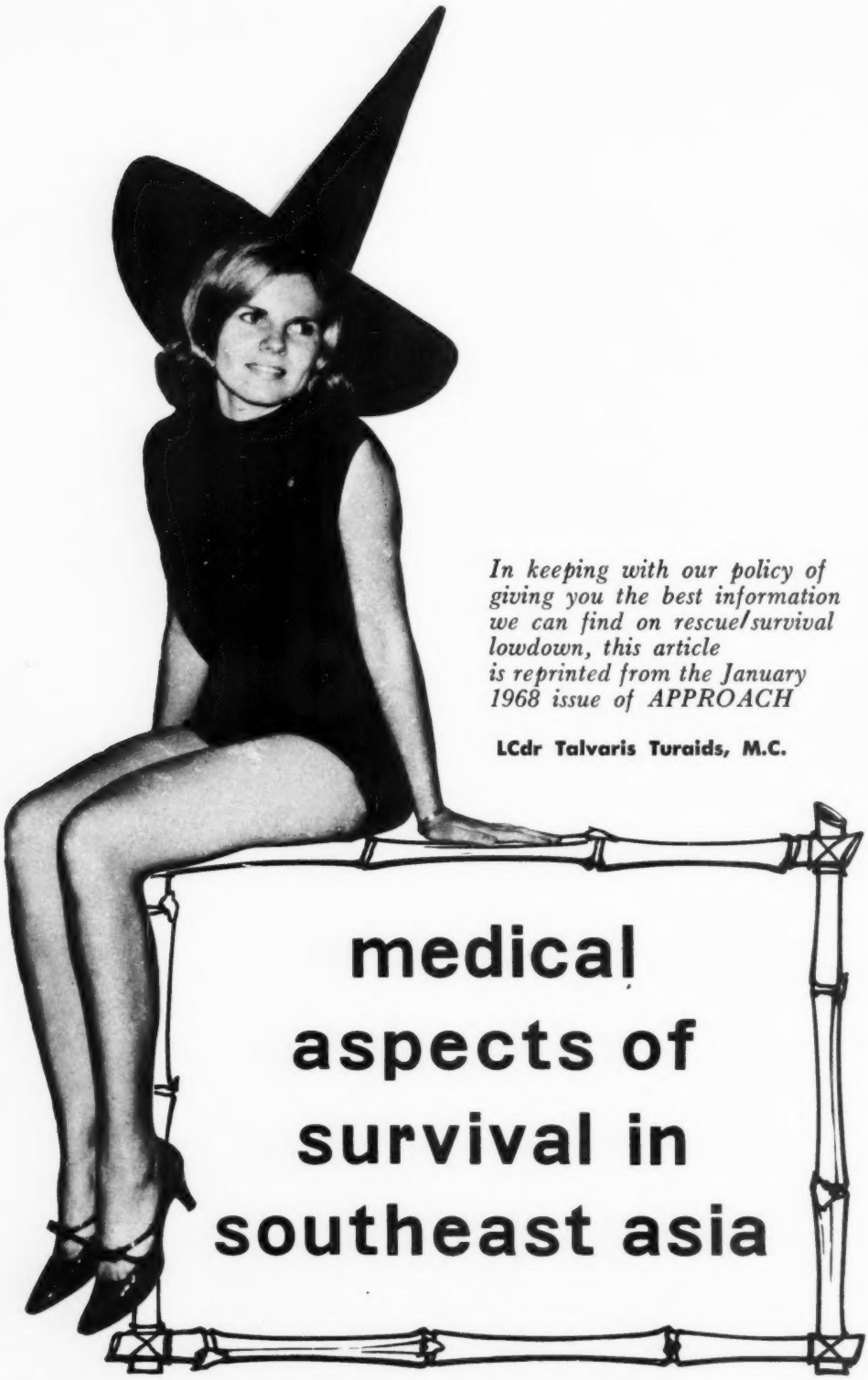
In the summer of 1965 the Defense Medical Supply Agency assumed responsibility for storage of water purification tablets. The following information was derived from their studies.

1. If the date of pack listed on the bottle is greater than 5 years, discard bottle completely.
2. If the date of pack is greater than 2 years, suspicion should be aroused as to full potency.
3. Likewise, if the wax seal is broken, the tablets may have lost their potency.
4. Do not use if the tablets are:
   a. Stuck together.
   b. Broken.
   c. Pulverized.
   d. Color is changed appreciably.
5. Color change should be interpreted as follows:
   a. When manufactured tablet is steel gray and contains 8 milligrams of titratable iodine.
   b. When beginning to deteriorate, tablets fade toward white and begin to lose titratable iodine.
   c. When tablet is yellowish tan, approximately one-half of useful iodine is gone.
   d. When tablet is brown and "flaky" it is useless.
   e. Final deterioration color is deep iodine brown, and tablet has absolutely no titratable iodine.
6. If tablets are needed to purify water and only yellowish tan (one-half strength) and you do not have access to new ones, then it is recommended that you use twice as many as normal.

**PROTECTION RATINGS OF VARIOUS CLOTHING SYSTEMS**

Protection Time in Seconds to Threshold Blister When Exposed to 2500° F Flame





*In keeping with our policy of giving you the best information we can find on rescue/survival lowdown, this article is reprinted from the January 1968 issue of APPROACH*

**LCdr Talvaris Turaids, M.C.**

# medical aspects of survival in southeast asia

**The following article is not intended to be absolute, uncontested doctrine on medical treatment in a jungle survival situation for, in medicine as in many other areas, there are many ways of doing things. If questions arise in your mind as you read, discuss them later with your flight surgeon**

*As with any survival material it is intended that you read this article before you find yourself in a life-threatening situation. It describes not only what you can do for yourself, but what you can do to help others. Often it will not be possible to carry out the treatment described. That is no reason why you should not know what the ideal therapy should be. Circumstances permitting, you can then always try the next best thing possible.*

*You may also feel that description of certain diseases prevalent in Southeast Asia is unnecessary if they cannot be cured in the field. However, if your skin and eyeballs should turn a bright yellow, or if you should have severe chills and fever every other day, you will certainly want to know the reason and what to expect.*

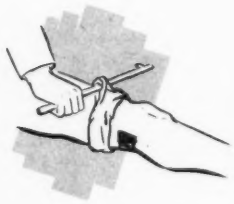
*Don't expect to learn a set of rules to be observed verbatim in medical problems as you would in an inflight emergency. There are no definite rules to be followed point by point in the treatment of disease. Every person is unique in his reaction to an illness and, therefore, treatment must be individualized. That is why medicine is an art and not a science.*

Emergency First Aid Measures

*Management of external hemorrhage:* Place a sterile pad directly over the wound and apply pressure by hand or firm dressing. A compression bandage will stop bleeding from most wounds in about 10 minutes. In case of a wound in an extremity, elevate the part. Compression above the wound ("pressure points") is used only to allow time for fashioning of a tourniquet or to permit grasping of a bleeder with a surgical instrument. Use a tourniquet only when bleeding cannot be controlled by safer methods; as a rule, it is required only when a major blood vessel has

*Arrest of hemorrhage and the relief of respiratory obstruction take precedence over all other procedures*

Place a sterile pad directly over the wound and apply pressure by hand . . . a compression bandage will stop bleeding from most wounds in about 10 minutes



Use a tourniquet only when bleeding cannot be controlled by safer methods . . . release the tourniquet slowly every 20 to 30 minutes for several seconds

Upper respiratory obstructions may be removed by turning the patient on his side with face pointing down, letting the force of gravity clear the airway

been opened. Using padding wherever possible, apply the tourniquet tightly at first to be certain that bleeding has been controlled. Then release the tourniquet slowly until slight oozing from the wound is seen. At this point apply slight further pressure, the objective being to control bleeding with the least possible pressure so that danger of nerve damage and injury to other tissues will be minimized. Release the tourniquet slowly every 20 to 30 minutes for several seconds or until bleeding starts. Freshly-made spider webs applied to a wound are said to assist blood coagulation.

*Management of respiratory obstruction:* Upper respiratory obstruction may occur in (1) the unconscious patient whose tongue falls back and whose mucus collects in the back of the mouth and trachea (windpipe); (2) fractured lower law or a wound of the mouth with a swollen immobile tongue and inability to clear mucus and blood; (3) chest injuries with inability to cough up material in trachea, largely because of pain.

Treatment for (1) above: turn patient on side with face pointing down, letting the force of gravity clear the airway (also transport such patients in this manner). Use your finger to remove stringy mucus from the throat. First aid kits carried by medics should contain an "airway" — a rubber or plastic device which is inserted in the mouth to hold the tongue down and provide unobstructed flow of air. It is not recommended that you try to fashion such an airway from materials at hand. Don't turn a patient over on his abdomen as then his breathing will be compromised.

For (2), treatment is same as above, but if a serious obstruction exists and the patient is obviously in dire need of air, emergency tracheotomy may be required to save his life. Take a pocket knife and holding the blade horizontally, make a stabbing wound immediately below the "Adam's apple" (thyroid cartilage) and above the next ring of cartilage (cricoid). It is most important to go in exactly at the midline and not to penetrate deeper than one-half inch. Then turn the blade vertically — you will now have an opening into the trachea. Insert some small tubular object (top of a fountain pen, piece of bamboo) to keep the airway open. *Needless to say, this seemingly simple procedure may be extremely dangerous in the hands of a novice. Discuss the procedure with your flight surgeon.*

For (3), fix chest wall by strapping to minimize motion on breathing and thus reduce pain. Morphine

tends to depress respiration; it should be given with caution especially if a head injury is also present. Inject sites of rib fractures with local anesthetic if available.

NOTE: Arrest of hemorrhage and the relief of respiratory obstruction take precedence over all other procedures.

### Wound Care

*Definitive wound care:* If it is possible to transport the victim to a first-aid station or hospital, leave wound care to practitioners of the art. Determine the general condition of the patient and perform emergency first aid measures. Apply a sterile dressing to open injuries after removal of gross foreign debris. Expose the wound itself as little as possible — most infesting organisms come from the hands and noses of attendants, onlookers, and the patient. A brief look to determine the site and probable extent of the wound is all that is required. Splints may be needed in any injury to the extremities. Treat for pain and shock if present and wait for the helicopter.

Under less ideal conditions, you may have to treat the injury yourself. Utmost attention to sterile technique cannot be overemphasized. Wash surrounding skin thoroughly with mild soap or antiseptic solution. Do not pour antiseptic into the wound. Use sterile water (boiled or treated with purification tablets). Freshly voided urine is normally sterile and may be used. Make a careful search for foreign bodies of any sort. Dead tissue also acts as a foreign body in delaying wound healing and providing a fertile field for bacterial growth. Cut away damaged skin edges but take care to remove no more than necessary as judged by the color of the skin. Loose pieces of fat and dead muscle tissue (torn, discolored, and infiltrated with blood) are next removed.

When all gross dirt and dead tissue have been removed, irrigate the wound thoroughly with sterile water (saline is preferred — add four salt tablets per pint of water) to wash out the smaller, invisible contaminants. Then apply a sterile dressing. If you have none, use cloth (strips of shirt, underwear, parachute, etc.) that has been boiled for at least 20 minutes.

Try to draw the edges of the wound together with the bandages as this will speed healing. Pack large wounds lightly open with fluffed gauze. Keep the wounded part at rest. Don't use antibiotic tablets unless infection develops. Maggots will help clean a wound since they feed only on dead tissue. Do not cover a wound when maggots are present.

### Types of Wounds

*Abrasions* are caused by scraping off the outer layers of the skin. They are easily infected by bacteria-laden foreign bodies ground into the abraded surface. Thorough cleansing with soap and water is necessary. Apply antibiotic ointment and sterile dressing.

*Incised wounds* bleed easily since the vessels have been cut cleanly by a sharp object such as a knife or broken glass. These wounds are less likely to become infected since there is little tissue damage and usually little foreign material is carried into the wound. Also, the profuse blood flow tends to wash out infective material.

*Lacerations* or tears are produced by blunt objects (shell fragments, etc.). Such wounds have torn, uneven edges and dead tissue and foreign matter are frequently present. Hemorrhage is seldom severe since the vessels are irregularly torn across. Infection usually follows without adequate treatment.

*Puncture wounds* are caused by penetrating instruments (knives, bayonets, punji stakes). These wounds are excellent sites for infection since they do not bleed freely and point of entry seals over quickly. Thorough cleansing and removal of foreign material is essential (the wound may have to be widened).

*Gunshot wounds:* The bullet is sterile but may carry fragments of contaminated clothing or skin into the depth of the wound. Do not attempt to probe and search for the bullet unless it is superficial and easily removed. The chances are that it will cause no serious harm if it has not already done so.

### Fractures

Improvise splints and immobilize the joint above and below the fracture. Do not attempt to set a fracture. In case of a compound fracture (bones sticking through the skin), remove any completely loose bone fragments, but do not attempt to put the bone ends back inside the wound. Clean the wound, dress, splint, treat for pain, and take antibiotic pills.

### Beriberi

Beriberi or thiamine (Vitamin $B_1$) deficiency has been recognized for centuries in the Orient but is rarely seen in the West except in chronic alcoholics. It is the disease associated with ignorance and poverty and usually occurs in states of general malnutrition. At least three months on a grossly deficient diet are required for the development of beriberi.

*Symptoms:* Onset is marked by gradually increasing fatigability, irritability, heart palpitations, and muscle tenderness (especially leg pains). The disease may

Do not attempt to set a fracture. Improvise splints and immobilize the joint above and below the fracture

affect chiefly the nervous system characterized by tingling and weakness of extremities followed by muscle wasting and contractures, or the circulatory system characterized by gradual heart failure and swelling of the legs.

*Prevention and treatment:* The specific therapy is thiamine. Yeast, liver, kidney, whole grains, nuts, eggs, and greens (vegetables, weeds, grass, leaves, etc.) are the best sources of this vitamin. It is practically absent in polished white rice. Foods must not be overcooked since excessive heat destroys Vitamin $B_1$. Cook the foods in as little water as possible and use the water in soups and broth.

Burns

Burns are tissue injuries caused by a wide variety of agents including flame, hot water, steam, electricity, and chemicals. General principles of treatment are the same in all. Burns are classified into three types according to the depth or degree of burn.

*First-degree burn* involves only the outer layer and follows prolonged exposure to sunlight or instantaneous exposure to more intense heat. There is redness, pain, and a slight amount of swelling. Since this is only a superficial injury, the capacity of the skin to prevent infection is retained. Healing takes place in three to six days. No treatment is required.

*Second-degree burn* is a slightly deeper injury characterized by blisters, pain, and considerable swelling. Morphine may be required for pain. Healing occurs uneventfully in two or three weeks unless infection occurs. All dirt, grease, adherent clothing and dead "shaggy" tissue dangling from the burn should be removed. Wash carefully with bland soap and sterile (boiled) water. Apply antibiotic ointment. Do not open blisters. Cover with sterile gauze and a pressure bandage. Change the dressing after five to eight days. Burns will heal better if immobilized and elevated. For infected burns take antibiotic tablets (one every 6 hours) and apply continuous hot wet compresses.

*Third-degree burn* is a very severe form of injury. There is destruction of the full thickness of skin (charring) and frequently of deeper structures also. Treatment for small areas is identical with that outlined above. However, when more than limited areas of the body surface are involved, hospitalization and intensive care is required or death may occur.

Bacillary Dysentery

Diarrhea, meaning frequent passage of unformed stools, is not a disease in itself but only a symptom of some other disease. One of the worst kinds of diarrhea occurs in bacillary dysentery, an acute infection of the large bowel caused by bacteria. There may be four to six bowel movements per hour and the stools may contain mucus, pus, and blood. Abdominal cramps, malaise (weakness), fever, and ineffectual, painful straining at stool are present. This disease is widespread throughout the world in areas where sanitation is poor and is particularly common in the tropics. The source is the excreta of infected individuals. Contagion is usually through feces-contaminated food, water, or fingers. Flies also serve to spread the disease.

Spontaneous recovery within four to eight days is usual. However, with the passage of 20 or more watery stools a day, weight loss and dehydration may become severe. The most important preventive measures are strict attention to personal hygiene, adequate sanitation, fly control, and proper safeguarding of food and water supplies.

*Treatment:* Take four oxytetracycline tablets initially and two tablets every 6 hours for 2 days and one tablet every 6 hours for another 4 days. (This differs from the dosage in the SEEK-2 kit which contains fewer tablets.) Take two antidiarrhea tablets four times daily. Diet is said to be unimportant; however, a bland diet moderately restricted in amount may be effective. Bouillon cubes (one cube dissolved in a cup of water and then cooled) are very soothing to an upset gut. Drink plenty of liquids, with one or two salt tablets per pint of water.

Abdominal pain and discomfort are usually relieved by the application of heat; rarely, morphine may be required. Charcoal can help. Scrape off the charred portions from a partially burned piece of wood and swallow them (a teaspoon every 4 hours up to a handful a day). Bones ground to a powder or burned and ground into ash may help. Tannic acid, present in commercial tea, tea made from boiled guava leaves,

and in tree bark, is an age-old remedy for diarrhea. Boil tree bark (preferably oak) for 12 hours to 3 days, adding water as needed. The resulting brew will be pitch black, unspeakably vile-tasting, and evil-smelling. Try drinking three to four tablespoons a day. (All survival manuals recommend this remedy as very effective, possibly because by the time the brew is ready, the diarrhea has begun to subside anyway. Also, watching the pot and constantly stirring the brew will help take your mind off other matters).

### Heat Disorders

Sweating is the most effective natural means of combating heat stress. So long as sweating continues, provided water and salt are replaced, man can withstand remarkably high temperatures. Thus, adequate water and salt intake and protection from the sun and heat will protect from the following:

*Heat exhaustion* results from physical exertion in a hot environment. Weakness, vertigo, dizziness, headache, nausea, and faintness may precede collapse. The victim is listless and apprehensive. Skin is ashen, cold, and wet; perspiration is profuse. This is a nonfatal physiological disturbance and recovery is excellent. Place the patient in a cool environment, and loosen tight clothing. Give plenty of cool water with one or two salt tablets per pint.

*Heat cramps* are painful contractions of abdominal or skeletal muscles caused by exertion in a hot environment when body fluids have been depleted of salt by unreplaced heavy losses in sweat. The victim may be prostrate with legs drawn up or thrashing about, grimacing and occasionally crying out from the excruciating pain. Treatment is the same as in heat exhaustion.

*Heat stroke* (sunstroke) may be rapidly fatal. Prolonged exposure to excessively high temperatures or the direct rays of the sun, combined with high humidity are the responsible factors. There is a breakdown of the sweating mechanism. The skin is hot and dry, very high fever is present, and mental confusion, staggering gait, convulsions, or coma may occur. Hydration and salt content of the body are normal. The aim of treatment is to reduce body temperature to a safe range (102° F or lower) as rapidly as possible or irreversible brain damage may occur. Ideally, total immersion in an ice bath or in water as cold as possible is the most efficient method of cooling. Vigorous massage of the limbs during cooling is important.

**If it is possible to transport the victim to a first-aid station or hospital, leave wound care to practitioners of the art. Treat for pain and shock if present and wait for helicopter**

### Infectious Hepatitis

Infectious hepatitis is an acute infection of the liver caused by viruses introduced by feces-contaminated food and water. Crowding, poor sanitation, and malnutrition are predisposing factors.

*Symptoms:* Onset usually is abrupt with fever, marked loss of appetite, malaise, distaste for tobacco, fatigability, headache, chilly sensations, nausea, vomiting, upper abdominal (liver) pain, itchy skin, light stool, and dark urine. About 5 days after onset, jaundice appears (yellowness of skin and eyes from bile pigments) but fever and other symptoms tend to subside. The jaundice deepens rapidly, reaching a maximum within a week, and then fades gradually in 1 to 6 weeks.

*Treatment:* There are no specific drugs. Bed rest during the period of worsening symptoms and increasing jaundice is most important, but as we acknowledged at the beginning of this article, impossible in a survival situation. The type of diet is not important though bland food may lead to less nausea. However, you have to keep up an adequate caloric intake which is difficult when appetite is totally lacking. Force yourself to eat. Understand that the disease is rarely fatal and seldom leads to chronic liver disease. Although symptoms may seem prolonged, recovery will be complete with no life-long need for diet or avoidance of alcohol.

### Infection

The cardinal signs of infection or inflammation are redness, swelling, pain, and warmth surrounding a wound. In tropical climates, moisture, heat, and less than ideal hygiene combine to encourage infection in the most minor of wounds. In an apparently small wound caused by a punji stake dipped in human excreta, a horrible infection can boil up within a few hours. Hence it is most important to clean and dress even the smallest scratch, cut, or insect bite and use antibiotic ointment on it. Keep your fingernails short to prevent infection from scratching. An intact, healthy skin is the first line of defense against infection.

*Cellulitis* is any inflammation of the tissues that shows a tendency to spread. It means that the invading germs are overcoming your body's defenses against infection. Locally, the area is red, swollen, painful, and warm with poorly defined borders. Fever, chills,

malaise, and headache may be present. Lymphangitis (spread along lymphatic channels draining the infection as evidenced by red streaks on the skin) and lymphadenitis (painful enlarged, tender nodes or glands into which the lymphatic channels drain) usually develop. Appearance of the red streaks is erroneously called "blood poisoning." This term is best applied to a rarer complication (bacteremia) where there is widespread distribution of infective material by way of the blood stream.

*Treatment of cellulitis:* The part involved should be put at rest and elevated when possible. Apply hot wet compresses for several hours each day. Change the compresses as often as necessary to maintain heat. Take antibiotic (oxytetracycline) two tablets four times daily for 3 days and one tablet four times daily for another 4 to 7 days. Take aspirin for the relief of pain and fever.

*Abscess:* An abscess or boil is a localization of an infection into a pocket of pus. When the infection "comes to a head" the skin above the yellow or white pus must be cut to allow the pus to drain out so that the wound or boil will heal. Make a generous incision, express the pus gently, and pack the wound open. Continue hot compresses and keep repacking daily or more often to allow healing from the bottom up.

*Furuncle:* A furuncle is a small abscess of a sweat gland or hair follicle. Treatment consists of hot packs and, if necessary, incision and drainage. Don't squeeze or cut before localization of pus. Antibiotic tablets are rarely indicated. Never squeeze furuncles on the face.

*Carbuncle:* A carbuncle is a group of adjacent furuncles with extension of infection under the skin. The back of the neck is a common site. Fever and malaise may be present. Hot packs, incision and drainage, and antibiotics may be required.

*Skin rashes* may arise from a legion of causes (bacterial, viral, or fungal infections, allergies, contact with certain plants, etc.). It would be impossible to try describing the various skin diseases here. Even dermatologists are frequently perplexed. Clean affected areas frequently with soap and water and apply antibiotic ointment if they look infected. Try to keep wet or weeping areas dry. Apply fat or vaseline to dry and cracking areas.

### Insect Bites

Many insects are disease carriers, notably mosquitoes, the common housefly, fleas, ticks, sandflies, and chiggers, to name a few. Insect bites can also result in severe secondary infections.

*Prevention and treatment:* Apply insect repellent or use green wood smoke to smoke up exposed parts. Keep your clothing loose (mosquitoes can easily bite through tight clothing). Tie the cuffs of your jacket and tuck trouser legs into boots. Use the mosquito head net correctly, especially at dawn and dusk. In the absence of insect repellent, use mud, the simplest protection against mosquitoes.

Coconut oil, tobacco juice, or lime juice protect against head lice. Check your body and clothes frequently and remove all ticks and lice. Look particularly at the hairy portions of the body and where clothing is tight. Remove ticks carefully. Steady pulling is preferable to crushing. If the head of the tick remains in the skin infection will result. Touching with a glowing cigarette or the application of insect repellent, kerosene, oil, or tobacco juice facilitates removal without leaving embedded remnants. Wash the site with soap and water and apply bacitracin ointment from Packet 1 of your SEEK-2. (A paste of aspirin and animal fat makes a good anti-itch cream.)

### Leech Infestation

Bloodsucking leeches are found in lakes, ponds, and damp tropical forests (particularly during the rainy season) and vary in size from a few millimeters to several centimeters in length. They cling to blades of grass, leaves, and twigs and attach themselves firmly to any passing individual. Their salivary gland secretion prevents the clotting of blood so that the wound continues to bleed after they have detached themselves. With heavy infestations, significant amounts of blood can be lost. Rarely, young leeches may be swallowed in drinking water, an event that can lead to serious illness.

*Prevention and treatment:* Keep pants legs tied tight around boot tops or inside tightly-laced boots when wading or walking through brush or grass. Examine your body frequently in bad leech country. Leeches should be removed with care lest their jaws be left in the wound. Severe secondary bacterial infection and ulceration of the wound may result through improper removal. Remove leeches gently and carefully. Do not hurry the process. Application of wet salt, vinegar, tobacco or lime juice, crushed iodine tablet, alcohol, dry ashes, or burning cigarette will facilitate removal. Then apply bacitracin ointment and cover the site with a bandaid.

### Malaria

Malaria is an acute, sometimes chronic, often recurrent febrile disease caused by several species of a one-celled parasite transmitted to man by the bite of the Anopheles mosquito.

*Symptoms:* The parasites attack the red blood cells wherein they divide repeatedly until the cells burst. The liberated parasites then attack new blood cells. It is this periodic breaking up of red blood cells which causes the chills and fever so characteristic of malaria. One to four weeks after infection, there is a period of a week or more of nonspecific symptoms frequently unrecognized as malaria and treated as influenza.

An abrupt onset of chills follows, lasting 20 to 60 minutes (cold stage). The victim has chilly sensations over his entire body, his teeth chatter, his skin becomes blue and cold, and there is uncontrollable shaking. A "hot stage" follows, lasting about 2 hours, with temperatures of 104° to 107° F. The victim has a flushed face, excruciating headache, and may be partially delirious. There is a sensation of intense heat with a hot, dry skin. This is followed by an abrupt onset of the "sweating stage" in which he breaks out into profuse perspiration, his temperature drops to normal, his headache disappears, and a feeling of well-being returns. Although weak and exhausted, he feels able to resume work. These paroxysms of chills and fever may occur daily, on alternate days, or with an interval of 3 days in between.

*Treatment:* Take one antimalaria pill a week (chloroquine-primaquine combination) during your stay in countries where malaria is prevalent. These pills will prevent malaria from developing or, in case of an infection, will cure it. Continue taking the drug for at least 4 weeks leaving a malarial zone.

### Snakebite

The most important point to keep in mind about snakebite is that, although serious, snakebite poisoning is usually neither fatal nor permanently disabling.

*Prevention:* Basic types of snake venoms are either hemotoxic (destroys the blood cells) or neurotoxic (attacks the nervous system). Depending on the type and amount of venom injected, one may have severe pain in the local site within a few minutes, rapid swelling and discoloration of skin with formation of blisters, and continued oozing of blood and tissue fluids from the puncture site. General body effects may include circulatory collapse, clammy skin, fast heartbeat, intense thirst, severe headache, dizziness, blurred vision, muscle spasms, vomiting of blood, fever, respiratory failure, and convulsions. Maximum venom effects usually occur in 24 to 36 hours. If fang marks are absent and there is no significant pain, swelling, or numbness at the bite site or tingling of the scalp, lips, or tongue within 20 minutes, one may assume that the snake was probably nonpoisonous.

*Treatment:* The objective of treatment is to slow the absorption of the venom so that it can be detoxified by the natural defensive mechanisms of the body. *(We are omitting here discussion of treatment by injections of antivenom and ice packs since neither are available in the typical jungle survival situation. —Ed.)*

- Kill the snake if possible and search for presence of fangs. Spend only a few moments at this. (Snake meat, including that of poisonous species, is a delicacy.)
- Lie down at once; apply a tight tourniquet 2 to 4 inches above the bite. Release the tourniquet every 20 minutes. Reapply ahead of the swelling if the swelling progresses.
- Remain as quiet as possible, for 24 hours, if feasible. Keep the bite site completely immobile and below heart level.
- Wash the surface of the bite thoroughly.
- Take antibiotic (oxytetracycline) tablets, one every 6 hours.
- Drink plenty of fluids.

*Do not* become excited, hysterical, or panicky. Don't cut into the bite site (absorption of venom will be enhanced from a larger wound; also, there will be more chance of subsequent infection). Don't use alcohol; it speeds up metabolism and absorption. Don't use morphine which may cause respiratory failure in the presence of neurotoxic venom.

### Trachoma

Trachoma is a serious and chronic viral infection of the eye which may lead to blindness. It is widely prevalent in the tropics and areas with poor sanitary conditions and low standards of living. Transmission is by flies, fingers, and contaminated articles of clothing. Trachoma may begin slowly or acutely with severe conjunctivitis (pink eye), itching, pain, swelling of lids, and abundant discharge of pus. To prevent infection, observe fly control and do not rub your eyes with dirty fingers or rags. Use bacitracin ophthalmic ointment as soon as *any* eye infection develops. Pull down lower eyelid and apply a small amount of the ointment every 4 hours.

### Worms

Several species of intestinal parasites are easily acquired in tropical countries. Symptoms vary, depending on the type of worm or worms present. However, you will not ordinarily be incapacitated, even with a long-standing infestation. Many natives live with them all their lives. Stress personal and environmental hygiene.

Vegetables grown in areas where human excreta is used for fertilizer should be thoroughly washed and preferably cooked. Some survival manuals recommend gasoline or kerosene, one teaspoon or more daily for 4 or 5 days. *Don't do it!* Serious liver and kidney damage or pneumonia may result. Two teaspoons of kerosene have been known to be fatal. (Drug of choice for most worms is piperazine.)

# USAASO Sez

## The U. S. Army Aeronautical Service Office discusses

airspace approval requirements

establishing alert areas

ON AIRSPACE: Thinking about building an airfield? Adding a new runway at an existing airfield? Adding or relocating a navigational aid? If so, have you checked your airspace? The Federal Aviation Administration Act says, ". . . no military airport or landing area . . . shall be acquired, established, or constructed, or any runway layout substantially altered, unless reasonable prior notice thereof is given the Administrator. . ."

AR 95-50 contains basic DA implementation of the FAA Act with regard to airspace responsibilitities and procedures for the Army. Check it first and then without delay

— call your DA regional representative (DARR) if in CONUS, or

— contact your Army staff airspace representative if in Alaska or Hawaii, or

— contact the DARR southern region if in USARSO.

For assistance in resolving problems arising in geographical areas outside the jurisdiction of the FAA, call or write the Air Traffic Control Division, USAASO, Cameron Station, Alexandria, Virginia 22314, Autovon 22-47796.

On alert areas: Have you been confused by something called an alert area? Dont' feel alone. Others have been, too. Here's the word: Alert areas are areas within which a high density of aviation training or unusual aerial activity is conducted. They are defined in terms of horizontal boundaries, vertical dimensions, time, assignment and type of operation. When established, alert areas are shown on appropriate aeronautical charts in manner similar to retricted areas.

An alert area has been established for Fort Wolters. Others are at this writing being processed for Fort Rucker and Hunter/Stewart. Establishment of an alert area does not

- Prevent other aircraft from flying within the designated area.
- Impose any communication requirements on pilots flying into or within the designated area.
- Relieve pilots of participating aircraft or transiting aircraft from the responsibility for collision avoidance.
- Provide an area solely for the use of the initiating activity or agency.

All that an alert area means to you is that when you are in it, you may be assured of constant companionship — other occupants of the airspace. So, keep alert, keep that head on a swivel and keep alive!

# Is it a flying saucer . . . or an explosion?

This is what many residents in southern Arizona have been asking themselves as they view flashes of light that occur periodically over the Fort Huachuca range at night.

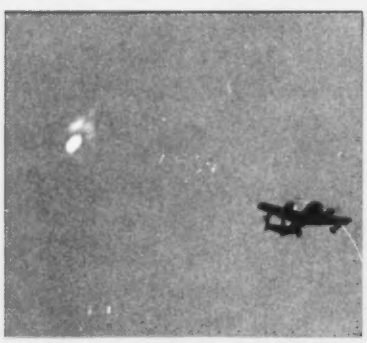
These strange flashes are neither UFOs nor explosions but flares released by the airborne sensors department of the Combat Surveillance School-Training Center in conjunction with night aerial surveillance practice (see below).

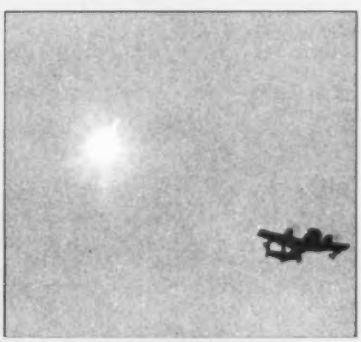
Most of the flares are fired in the early evening hours.

There is nothing dangerous about the flashes. The explosion that many people hear is merely a flare being propelled away from the OV-1 Mohawk aircraft used for the nighttime photography. As soon as the flare ignites, the shutter of the photographic equipment is triggered. The result is a high quality picture of the area beneath the plane.

The flares are used in the student aviator combat surveillance courses, the senior NCO orientation courses and in the senior officer orientation courses.

Since nighttime photography is the best means of observing the enemy and their movements in a combat area, this training will be beneficial when used in Vietnam.





"Double, double toil and trouble;
Fire burn and cauldron bubble."*
Chin strap loose or chin strap tight;
How wear you your helmet this night?
See page 52.
*Shakespeare